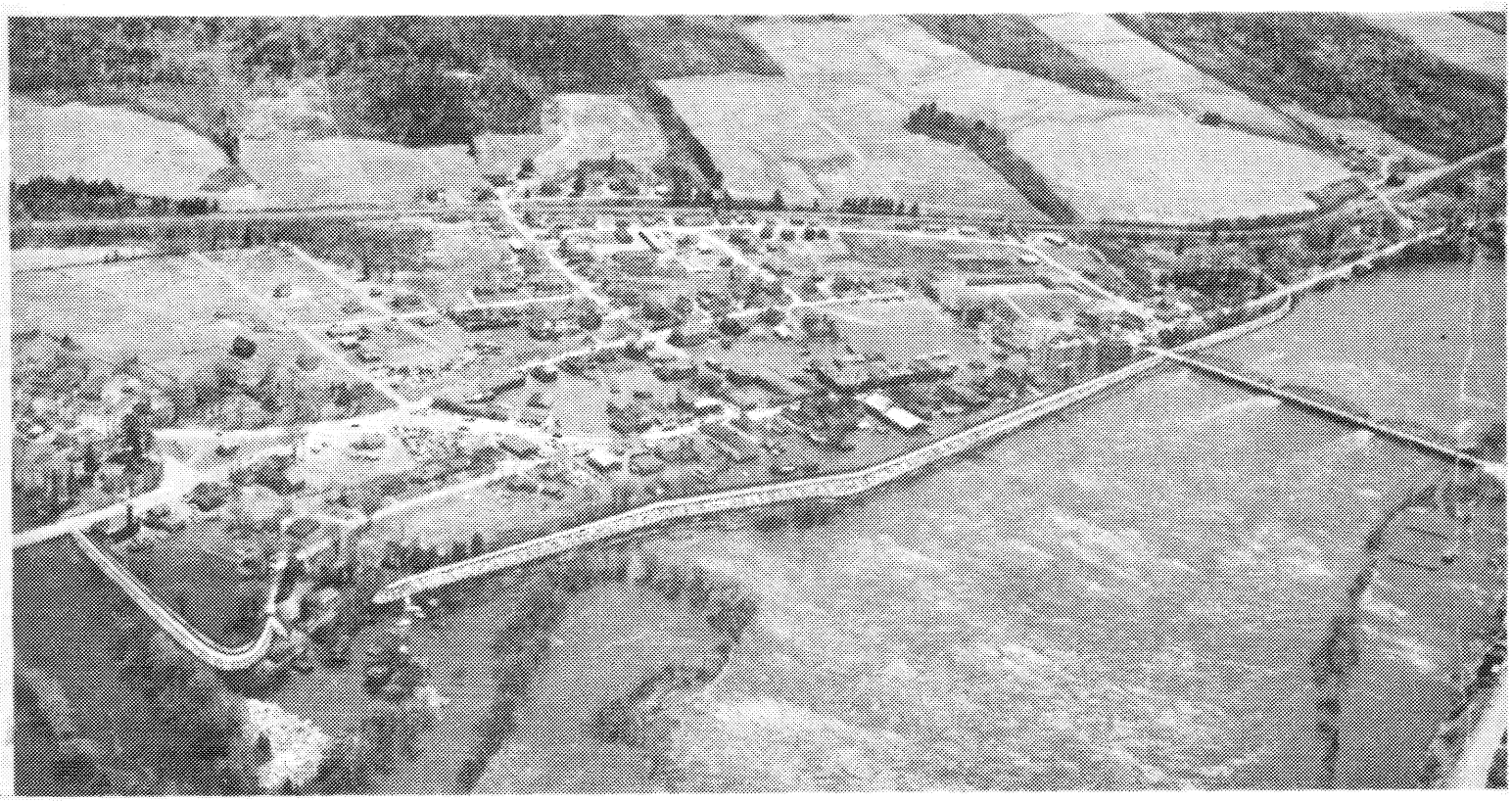
FORT KENT LOCAL FLOOD PROTECTION
ST. JOHN RIVER

DETAILED PROJECT REPORT
WATER RESOURCES DEVELOPMENT
FORT KENT, MAINE



NOVEMBER 1974

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDPL-P

27 November 1974

SUBJECT: Fort Kent Local Flood Protection, St. John River, Fort Kent, Maine - Detailed Project Report

HQDA (DAEN-CWP-E)
WASH DC 20314

1. In accordance with ER 1165-2-12 dated 1 April 1965 and letter from General Morris dated 26 September 1973, (subject: Small Projects Programs), there are submitted for review and approval 10 copies of the subject report and a separate Statement of Findings. An environmental impact statement, indicating minimal adverse effects from the project, has been coordinated and will be forwarded under separate cover.

2. Appendix 2 contains letters of preliminary assurances from the Town of Fort Kent indicating the intentions and capability of local interests to meet the requirements of local cooperation. Formal assurances of participation, as well as formal approval from the Governor of the State of Maine, will be acquired subsequent to approval of the Detailed Project Report.

3. Plans and specifications will be prepared substantially in accordance with this report as approved. Funds will be required in the amount of $90,000 for preparation of plans and specifications and in the amount of $1,265,000 for construction and supervision and administration. Because of the urgency of the flood situation at Fort Kent it is requested that $90,000 be furnished immediately for plans and specifications so that a contract can be awarded at the start of the 1975 construction season. Estimated construction funding requirements would be $50,000 in fiscal year 1975 to award a contract and $1,215,000 in fiscal year 1976 for project completion.

4. An addendum included in Appendix 4 of this report provides pertinent information required by the proposed ER 1105-2-200 and Water Resources Council Procedure No. 1.

JOHN H. MASON
Colonel, Corps of Engineers
Division Engineer

Incl (10 cys)
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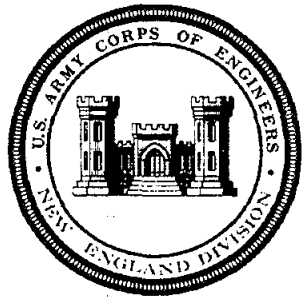
SAINT JOHN RIVER FLOOD CONTROL

FORT KENT

LOCAL PROTECTION PROJECT
SAINT JOHN RIVER
MAINE

DETAILED PROJECT REPORT



NOVEMBER 1974

LOCAL FLOOD PROTECTION PROJECT

SAINT JOHN RIVER

FORT KENT, MAINE

DETAILED PROJECT REPORT

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LOCAL FLOOD PROTECTION PROJECT

SAINT JOHN RIVER

FORT KENT, MAINE

November 1974

PERTINENT DATA

1. Purpose	Overbank flood protection for the Commercial Center of Fort Kent, Maine
2. Location	The Town of Fort Kent in Aroostook County, Maine, at the confluence of the Saint John and Fish Rivers
3. Type of Improvement	Earth dike, raised roadway, drainage facilities, pumping station, and pressure conduit.

4. Hydrology

Drainage Area at Fort Kent	5690 square miles
Maximum Flood of Record	1 May 1974
Discharge	148, 000 c. f. s.
Elevation at International Bridge	516. 8' m. s. l.
Project Design Flood (100 year)	
Discharge	175, 000 c. f. s.
Elevation at International Bridge	519. 0' m. s. l.

5. Dike

Type	Impervious Earth Fill
Length	3245'
Top Elevation	521. 5 to 520. 0 m. s. l.
Top Width	15'
Maximum height	
(above riverbed)	25 feet
(above existing top of bank)	10 feet
Slopes, riverside	1 on 2. 5
Landside	1 on 2

6. Raised Roadway

Length	580'
Top Elevation	518' m. s. l.
Top Width	16 feet
Maximum height	5 feet
Slopes, riverside	1 on 2
Landside	1 on 2

7. Pumping Station

Structure	Reinforced concrete
Size	22' x 24. 5'
Pumps	2 Axial flow
Pumps, capacity ea.	20 c. f. s. (9000 g. p. m.)
Drive	Diesel Engines
Sluice Gates	2 - 3' x 3'

8. Pressure Conduit

Capacity	60 c. f. s.
Length	330 feet
Size	48-inch diameter R. C. Pipe
Gates	1 - 4' Sluice Gate
	1 - 4' Flap Gate
Headwalls	Reinforced Concrete

9. Principal Quantities

Excavation	5, 000 c. y.
Impervious Fill	44, 300 c. y.
Random Fill	25, 000 c. y.
Gravel bedding	7, 700 c. y.
Stone Protection	13, 700 c. y.
Topsoil	1, 600 c. y.
Pumping Station	22' x 24. 5'

10. Relocations

Two story wood-frame residence
Owner - P. Michaud
78 W. Main Street

11. Real Estate Acquisitions

Acres	9. 2
Severence Damages	$20, 000
Acquisition Costs	$55, 500

12. Cost Estimates

First Costs

Federal	$1, 355, 000
Non-Federal	200, 000
Total	$1, 555, 000

Annual Costs

Federal	$ 84, 500
Non-Federal	15, 500
Total	$ 100, 000

13. Benefits

Average annual benefits	$225, 041
Flood Control	$208, 630
Redevelopment	$ 16, 411

14. Benefit-Cost Ratio 2. 3 to 1. 0

NOVEMBER 1974

ST. JOHN RIVER LOCAL PROTECTION
FORT KENT, MAINE

DETAILED PROJECT REPORT
WATER RESOURCES DEVELOPMENT

The Study And Report

PURPOSE AND AUTHORITY

Because of the persistent flooding situation along the Saint John River at Fort Kent, Maine, which has seen record floods during late April 1973 and again during early May 1974, this study was undertaken to examine alternatives for flood control, both structural and non-structural, which would provide a high degree of flood protection at Fort Kent. From the study of alternatives, a feasible, economically justified plan of improvements has been selected and is described herein.

The Detailed Project Report is submitted pursuant to authority contained in Section 205 of the 1948 Flood Control Act, as amended by Public Law 93-351 (Water Resources Development Act of 1974) adopted 7 March 1974. Specific authority is contained in 1st Indorsement dated 12 September 1972 from the Chief of Engineers in reply to a Reconnaissance Report from the Division Engineer, New England Division, dated 1 June 1972, recommending the study.

SCOPE OF STUDY

This Detailed Project Report reviews the general overbank flood problem affecting the commercial center of Fort Kent, Maine, located at the confluence of the Saint John and Fish Rivers. Fort Kent

has been subjected to periodic flood damages, principally due to its proximity to the rivers and changing conditions in the upper watershed, which has allowed for an increased rate of runoff from spring storms and snowmelt.

This report submits a definite project plan of improvement which provides 100 year frequency flood protection for commercial and residential properties at Fort Kent. The plan proposes the construction of an earth dike, a raised roadway, interior drainage facilities, including a pressure conduit and a permanent pumping station to discharge interior drainage.

Detailed topographic surveys of the proposed project site, at a scale of 1" = 40', were initially made during 1962 and were supplemented and revised during October 1972 and June 1973.

Subsurface explorations were performed during October 1972 and consist of core borings and test trenches. The location of foundation explorations is shown on Plates 3 and 4. A description of the field investigations and logs of the explorations, including classification of materials, are included in Appendix 1, Section C.

To determine the extent of damage experienced in past floods, a detailed flood damage survey was conducted during June 1973, and updated after the subsequent record flood of May 1974. An analysis of population trends, labor market statistics, and socio-economic effects were prepared and is included in Appendix 1, Section B.

Field reconnaissances for Real Estate studies were made during October 1973 and June 1974. A detailed Real Estate appraisal is included in Appendix I, Section D.

STUDY PARTICIPANTS AND COORDINATION

During the early stages of the detailed studies, a public meeting was held in Fort Kent (14 May 1973) to determine the specific needs and desires of local interests. All Federal, State, and local agencies having an interest in flood control improvements were notified of the meeting. About 110 people were present at the meeting and several participated and commented on a proposed solution to the flood problem. A digest of the public meeting is included in Appendix 3 of the report.

The following State and Federal agencies were requested to comment on the selected plan of improvements at Fort Kent:

U. S. Department of Agriculture, Soil Conservation Service
U. S. Environmental Protection Agency
U. S. Department of the Interior
Fish & Wildlife Service
General Services Administration
Maine Soil & Water Conservation Commission.

Their response to the proposed plan in the form of letters of comment and concurrence is included in Appendix 2. A letter from the Fort Kent Town Council, indicating preliminary intent to provide assurances of local cooperation, is also included in Appendix 2. Formal assurances would be required from the Town of Fort Kent and the State of Maine prior to completion of final design.

THE REPORT

This Detailed Project Report, including Appendices, is complete within itself and is the final report prior to preparation of plans and specifications and construction of the project. The main report contains technical and non-technical information including discussions of alternatives and recommendations for local flood protection at Fort Kent. The appendices include detailed technical reports which more readily facilitate engineering review and pertinent correspondence and reports from Federal, State, and local agencies.

PRIOR STUDIES AND REPORTS

The serious recurring flood problem at Fort Kent has been the subject of Reconnaissance Reports dated 2 January 1964 and 1 June 1972. The 1964 report concluded that there were insufficient annual benefits, to justify construction of a project having a 20 year amortization period. The reasoning for the 20-year life, in lieu of the normal 50-year life, was the premis that the Dickey-Lincoln School Dams would be constructed within the twenty year period and would afford complete flood protection for Fort Kent. However, the

incidence of record flooding during 1969* and the uncertainty of the eventual construction of the upstream dams necessitated a re-evaluation of the local protection project resulting in the June 1972 Reconnaissance Report. The report indicated that the proposed dike project was economically feasible and within the scope of the Section 205 authority. By 1st Indorsement dated 11 September 1972 the Chief of Engineers authorized preparation of a Detailed Project Report.

Resources And Economy Of The Study Area

ENVIRONMENTAL SETTING AND NATURAL RESOURCES

The Saint John River Basin, one of the largest in North America draining to the Atlantic Ocean, is located in northern Maine and the Canadian provinces of Quebec and New Brunswick, between the watersheds of the Saint Lawrence River to the north and Penobscot River to the south. It has a total drainage area of 21,360 square miles, of which approximately 35%, or 7630 s. m., lies in the United States (Maine). The location of the Saint John River Basin is shown on Plate No. A-1 of Appendix 1, Section A.

The Saint John River rises in northwestern Maine at the confluence of Bailey Brook and the Southwest Branch and flows in a general northeasterly direction to Fort Kent, then flows easterly along the Maine-Canada border and southerly through New Brunswick to the Atlantic Ocean at Saint John, New Brunswick, Canada. Principal tributary streams include the Big Black, Little Black, Allagash, Fish, and Aroostook Rivers.

Climate of the upper Saint John River Basin is cold with an average yearly temperature of 40° Fahrenheit. Summers are cool, averaging 50° to 60° F while winters are long and extremely cold with temperatures averaging 10° to 20° F. Sub-zero temperatures occur approximately 50 days each year.

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* Subsequent record floods occurred during April 1973 and May 1974.

In this frigid climate, heating units are located in building basements. When water floods the property, heat loss occurs causing frozen pipes and great distress. Resulting property damage lowers values and increases depreciation.

Average yearly precipitation is about 36 inches. Because of its northerly location the area escapes intense rainfall associated with hurricanes that principally occur during the late summer and early fall. The area does experience moderate to heavy rain and/or snow fall as a result of low pressure systems moving up the east coast and from frontal systems moving from west to east. All record flood events at Fort Kent occurred during April and May when a combination of rainfall and snowmelt caused overbank flooding. Ice jamming has not been a factor during these flood periods until May 1974 when large ice jams located upstream released a surge of water and ice which caused record flood levels at Fort Kent.

The upper Saint John River is characterized as a clear, cold, fast flowing stream and is an excellent fish and wildlife habitat. This portion of the watershed is heavily wooded with deciduous and evergreen trees. Canoeing, fishing, and hunting are important resources of the upper watershed. Fort Kent is predominatly an agricultural community with its major products being potatoes and lumbering. Historical resources include the Fort Kent Blockhouse which has been designated a National Historical Landmark. The commercial center of Fort Kent is situated on a relatively narrow flood plain, about 10 to 12 feet above the normal water surface.

HUMAN RESOURCES

The town of Fort Kent, with a population of 4,575, is the activity center of the Fort Kent Labor Market Area (FKLMA). In December 1967, the labor market area was designated by the Economic Development Administration as a chronically distressed labor market with a substantial and persistent surplus of unemployed labor. The total population in the Fort Kent labor market area in 1970 was 10,836, with five communities account for 80 percent of the Area population. The current 1974 unemployment rate is nearly 12 percent.

An analysis and comparative study of current trends in population, civilian labor force, family income, and employment shows that poverty is a true way of life for the residents of the Fort Kent Labor Market Area. Population has declined by nearly 30 percent since 1950. The median family income in the town of Fort Kent was $6,780 in 1970 and nearly 20 percent of the population has an income below the official poverty level. Each of these figures was higher than their comparable state and national counterparts.

Table 1 shows that population losses were particularly acute during the past twenty years in the Fort Kent and Madawaska-Van Buren Labor Market Areas, (MVBLMA) and in Aroostook County.

TABLE 1 - POPULATION

AREA	NUMBER			PCT CHANGE	
	1950	1960	1970	1950-60	1960-70
FK LMA	14,851	12,245	10,836	- 17.6	-11.5
MVB LMA	11,910	11,771	10,865	- 1.2	- 7.7
AROOSTOOK	96,039	106,064	94,078	+ 10.4	-11.3
MAINE	913,774	969,265	993,663	+ 6.1	+ 2.5
USA (000)	151,326	179,323	203,166	+ 18.5	+13.3

The basic cause for population decline is felt to be the sharp drop in agricultural jobs experienced in the past two decades. In addition, the percentage share of total rural population in both labor market areas and Aroostook County has been declining. With a higher rate of net outmigration than the state during the 1960's, northern Maine lost over 11 percent of its population. Population losses struck hardest at the 0-14 age groups and the 25-44 age groups. Nevertheless, the area has an abnormally high percentage of its population in the dependency years, including senior citizens, with a less than adequate share of working age people.

Despite the high outmigration rate of Northern Maine, Table II shows that there is still an unusually high level of unemployment

as well as much hidden unemployment.

TABLE II - CIVILIAN LABOR FORCE

Area	Year	Labor Force	Labor Force Participation	Unemployment Unemployed	Unemployment Rate
FK LMA	1960	2,469	34.6	367	14.9
	1970	2,780	38.9	327	11.8
MVB LMA	1960	3,569	50.3	288	8.1
	1970	4,300	59.1	400	9.3
Aroostook	1960	29,728	43.5	1,888	6.4
	1970	32,450	50.7	2,947	8.8
Maine	1960	353,398	51.7	22,814	6.5
	1970	394,600	54.4	23,000	5.8
USA (000)	1960	70,612	55.9	3,931	5.6
	1970	86,000	57.6	4,088	4.9

All five labor market areas in Aroostook County have been chronically distressed economic areas since 1971. Particularly in Northern Maine and the Fort Kent Area, the labor force growth rate over the past decade has been slower than the state and national averages. During 1971-1973, the unemployment rate declined in the Fort Kent Area and increased in the Madawaska Area. However, it remained, on the average, 50 percent or more above the state level. During the same period, the civilian labor force declined. This is a very harsh way to cut exceedingly high unemployment rates. A complete description of human resources is included in Appendix 1, Section B.

ECONOMIC STRUCTURE AND ACTIVITY

The major reasons for low family median income levels in Northern Maine is the lack of jobs and the lack of manufacturing employment opportunities accompanied by the skilled supporting services. In Aroostook County 4,200 jobs, generally associated with a male labor force, have been lost over the past decade. 1,800 additional jobs were added, but these were basically dependant on a female labor force.

Lack of jobs is evident in the Fort Kent Area. Here employment is evenly distributed between Agriculture, Manufacturing, Trade, and Government. The important linkage and multiplier effects have been restricted because of the small share of employment in manufacturing which emphasizes non-durable goods, along with its extremely strong dependance on a single crop farm economy and limited manufacturing emphasizing non-durable goods. Northern Maine does not have a mature economy. More and faster economic growth is essential in order to improve individual welfare and provide a better standard of living. This can only result from improved job opportunities with emphasis on the rapid growth industries of manufacturing.

With the probability of future flooding, of the Fort Kent commercial center, increasing each year, it is evident that economic growth of the community will be severely impaired unless flooding is eliminated. Not only will future floods incur economic hardship in Fort Kent, but also expansion of existing facilities and increased inventories will be precluded. For the short term, construction of a local flood protection project will decrease local unemployment levels and for the long term it will allow local merchants to operate and expand their business without fear of flooding.

Problems And Needs

STATUS OF EXISTING PLANS & IMPROVEMENTS

There are no existing Corps of Engineers projects at Fort Kent or on the Fish or Saint John Rivers. No improvements for flood control or other allied water resource purposes have been made by other Federal agencies in this area, except for a bank erosion project along the Fish River upstream from the Main Street Bridge, constructed by the Federal Disaster Assistance Agency (FDAA), during the summer of 1973. The stone protection placed on about 1000 linear feet of the left riverbank at a sharp bend in the river will prevent further erosion of the steep bank, thereby affording protection to property owned by the University of Maine at Fort Kent.

Current legislation has authorized further study by the Corps of Engineers, of a proposal to construct multi-purpose dams and reservoirs on the Saint John River at Dickey and Lincoln School, Maine, located about 30 miles upstream from Fort Kent. While the projects would primarily serve as a source for hydro-electric power, sufficient flood storage capacity would be included so as to prevent future damages at Fort Kent and other downstream communities. Because of the controversial nature of the project and opposition by private power companies and conservationists, as well as, the increasing frequency of flooding at Fort Kent, it is considered viable to construct the local protection project as a "first added" in a flood control system. Although this would reduce the amount of flood control benefits available to the Dickey-Lincoln School project it would not substantially change its benefit-cost ratio.

FLOOD PROBLEMS

The flood problem at Fort Kent involves general overflow of the Saint John River during the spring snow melt and runoff period. Prior to May 1974 flooding has always been the result of heavy rainfall combined with snowmelt. However, during late April 1974, a large ice jam in the upper watershed broke up and released a surge of water and ice which not only flooded the community center but also destroyed the concrete USGS gaging station which had been in operation since October 1926. Although the commercial center of Fort Kent is vulnerable to flooding it is located 10 to 12 feet above the normal water surface, and is, therefore, not considered to be within the limits of low lying flood plain. The increased frequency of flooding at Fort Kent has been attributed to lumbering operations in the upper watershed which has allowed for more rapid snowmelt during the spring thaw period. Photographs of the April 1973 and May 1974 flood, as well as ice jam conditions that occurred during May 1974 above Fort Kent, are shown on the following pages:

IMPROVEMENTS DESIRED

A number of meetings have been held with local interests to determine their attitude towards the proposed plan of flood control. Due to the increased frequency of flooding local interests are desirous of preventing future flood damages to the commercial center of town. At the Public Meeting, held on 14 May 1973, it was the general opinion that structural measures such as an earth dike, raised roadway and pumping station would be the most feasible and economical plan of improvements. At several informal meetings, structural and non-structural methods were discussed in detail and items of local cooperation were explained to local officials.

Formulating A Plan

FORMULATION AND EVALUATION CRITERIA

Formulation and evaluation of the plans for local flood protection at Fort Kent, including structural, non-structural and no action alternatives, were based on technical, economic, and intangible criteria including environmental analysis. The following technical and environmental criteria were utilized in determining a proposed plan of improvements.

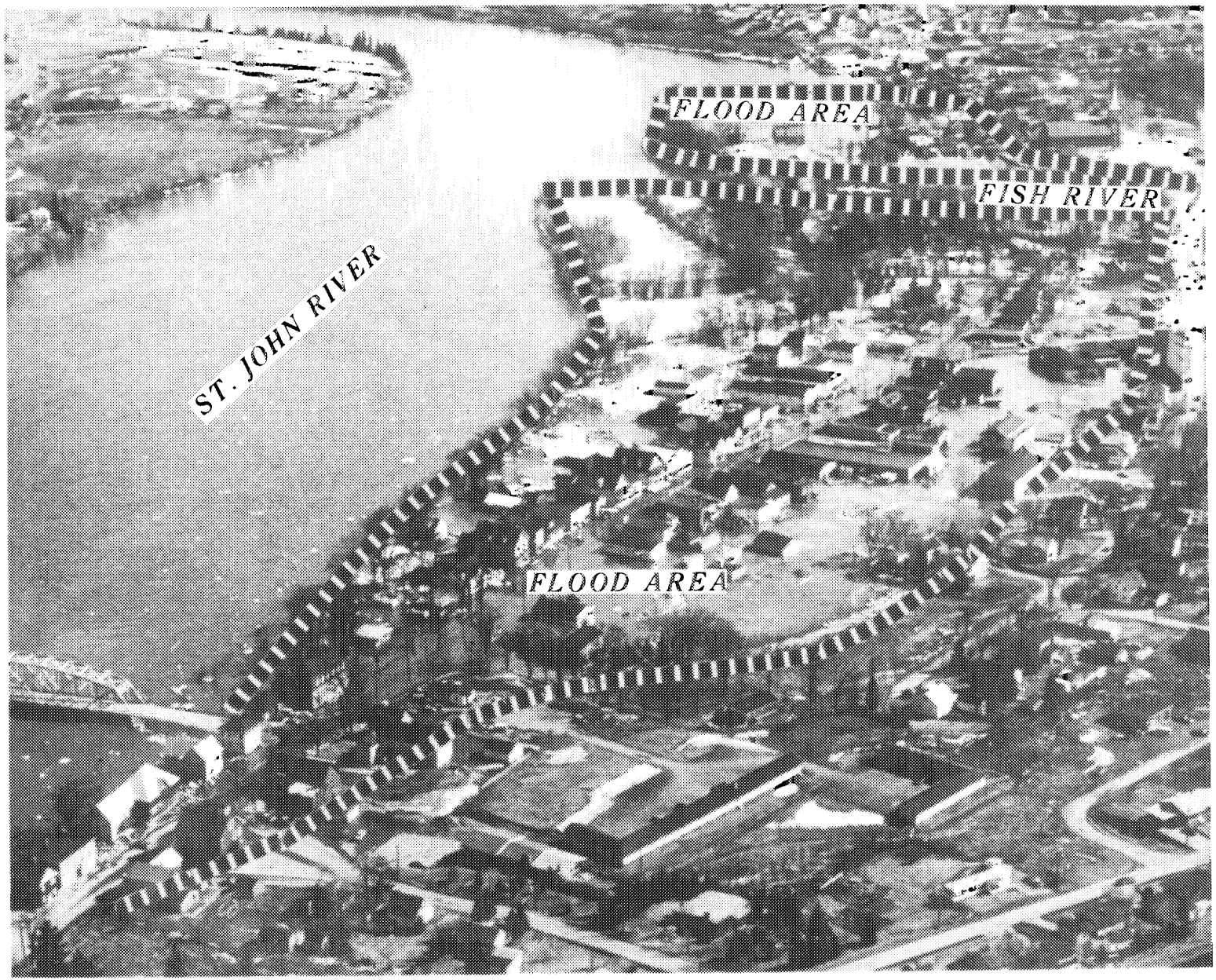
Technical Criteria

The following technical criteria was adopted for use in developing a plan of improvements:

a. The 100 year frequency flood was adopted as the project design flood.

b. Two feet of freeboard allowance was established on the basis of streamflow and river characteristics as well as site conditions.

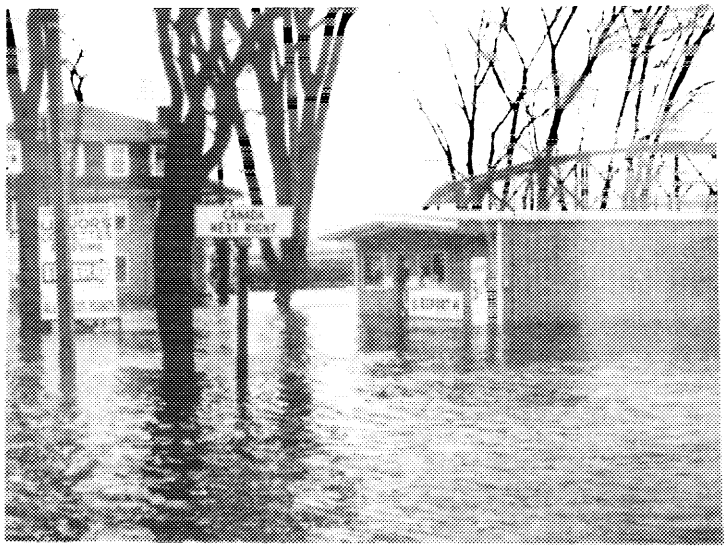
c. The earth dike cross section selection was based on standards for design, site conditions, cost considerations, and availability of materials.



AERIAL VIEW OF FORT KENT FLOOD AREA

FLOOD OF 30 APRIL 1973

FLOODING OF PROPERTIES ALONG MAIN STREET



FLOOD OF 30 APRIL 1973

FLOODING OF PROPERTIES ALONG MAIN STREET

VICINITY OF INTERNATIONAL BRIDGE

NORMAL FLOW CONDITIONS

LOOKING UPSTREAM FROM INTERNATIONAL BRIDGE

ICE JAM FLOOD OF 1 MAY 1974

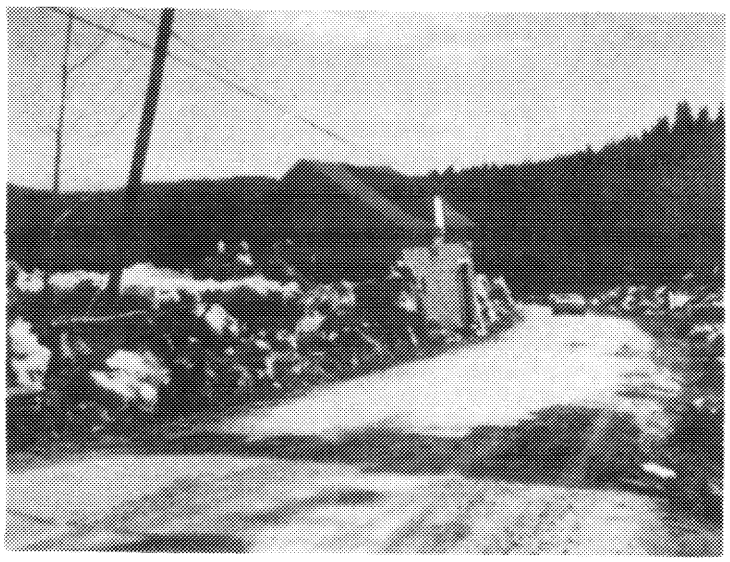
FLOOD OF 1 MAY 1974

FLOODING OF PROPERTIES ALONG MAIN STREET

ICE JAM FLOOD OF 1 MAY 1974 ICE FLOW ON ST. JOHN RIVER AT INTERNATIONAL BRIDGE
PHOTO BY BANGOR DAILY NEWS

ICE JAM FLOOD OF 1 MAY 1974
WATERS RECEEDED

ICE BLOCKS LEFT ON MAIN STREET AFTER FLOOD
PHOTO BY BANGOR DAILY NEWS



FLOOD OF 1 MAY 1974

ICE DEPOSITS ALONG MAINE ROUTE 161

ABOUT 15 MILES UPSTREAM FROM FORT KENT

ICE JAM FLOOD OF 1 MAY 1974 DEPOSITS OF RIVER ICE ALONG MAINE ROUTE 161 ABOUT 15 MILES UPSTREAM FROM FORT KENT PHOTO BY BANGOR DAILY NEWS

d. Modifications of the existing roadway at the Fort Kent Blockhouse were established to provide the least disruption of the National Historical Site and provide adequate flood protection.

e. Interior drainage facilities were designed to be compatible with the degree of flood protection afforded.

f. Dike alignments were selected to permit maximum land use potential without encroaching on the existing river width.

Environmental Criteria

The primary environmental considerations, both adverse and favorable, for the proposed project include:

a. General public acceptance of proposed plan.

b. Public health, safety, social well being, and possible loss of life.

c. Removal of several large, deseased elm trees.

d. Change in land use requirements in project areas.

e. Restricted views of river.

f. Improved aesthetics of existing trash deposit areas.

POSSIBLE SOLUTIONS

Several alternative measures, both structural and non-structural, to prevent future flood conditions at Fort Kent have been investigated. In addition, modifications of the proposed plan, including changes in dike alignment, top of dike elevations and substitution of concrete or sheet pile walls in lieu of earth embankment, were evaluated.

An evaluation of non-structural measures follows:

Permanent evacuation of the flood plain is not a practical or economically feasible solution to the flood problem. The cost of building, removal, or demolition, and reconstruction was found to be excessive. In addition, relocated or reconstruction of utilities and the cost of replacement lands outside the flood plain would far outweigh attributable benefits. The following data documents the high costs involved with flood plain evacuation.

Land Costs

Existing land in floodplain = 48 acres. If town center relocated more land should be provided - say 100 acres. Land costs - $2,000/acre $2,000 x 100 = $200,000.

Building Costs

a. Total Assessed Value of 60 Commercial and 4 Public Service Buildings (U.S. Customs, Town Hall, Post Office, Fire Station) = $1,412,170. Based on average replacement costs, this figure was doubled to obtain a cost to replace these buildings at another site. Buildings are either too large or are of the type of construction that would make it difficult or impossible to move.

Replacement of Commercial & Public Service = $2,824,340.

b. 37 Residential homes - 26 can be moved, 11 must be replaced.

Moving Cost

House Moving	$3,500
Foundation Cost	4,000
Grading, topsoil, seeding	800
Engin. & Contingencies	1,300
Total	$9,600

$9,600 x 26 - $249,600

Replacement Cost

$22,000 average cost to replace home excluding land cost.

$22,000 x 11 = $242,000

c. Total cost to relocate and replace buildings.

$2,824,340
249,600
242,000
$3,315,940

Utility Costs

Sewer - 5 miles of interceptor necessary @ $17/L. F.

26,400 x $17 = $448,800

Water - 5 miles @ $10/L. F.

26,400 x $10 = $264,000

Electric & Telephone - New Service would be provided by Utility Companies.

Road Construction

About 2 miles of new road would be required @ $50/L. F. including storm drainage 10,500 x $50 = $525,000.

Moving Expenses

a. Commercial & Public Service

56 x $2,500 = $140,000

b. Residential

37 x $800 = $29,600

c. Total = $169,600

Demolition Costs

Area must be cleared and refuse spoiled. In addition, area should be graded and seeded to prevent erosion during future floods.

Estimated Cost = $200,000

Total cost to relocate property

a.	Land Costs	$200,000
b.	Building Costs	
	1. Commercial & Public Service	2,824,340
	2. Residential	591,600
c.	Utility Costs	712,800
d.	Road Construction	525,000
e.	Moving Expenses	169,600
f.	Demolition and Regrading Costs	200,000
	Sub-total	$5,223,340
	(25%) Contingencies	1,305,660
	Total	$6,529,000

Flood proofing of existing buildings would be difficult because of the age of the buildings and the wood frame construction. Flood proofing also would not prevent flooding to 48 acres of land, which would continue to be a hazard to local property owners.

Flood plain zoning and building code restrictions would not be effective for the commercial center of Fort Kent as most of the flood prone lands were developed years ago with only limited undeveloped parcels of land remaining within this commercial area.

The Town of Fort Kent is eligible for Federally subsidized flood insurance coverage but only a small percentage of owners purchased the insurance prior to the May 1974 flood. Even with insurance coverage the burden of the flood damage would only be transferred from the property owner to others. Net losses would remain the same.

The following structural improvements to provide flood control at Fort Kent were investigated:

A plan for construction of sheet pile and concrete T-walls in lieu of an earth dike was abandoned when comparative cost estimates indicated that the cost of walls exceeded the proposed earth dike. In addition, there would be no savings of land because the required set back of the walls from the top of bank would be situated near the landside toe of the proposed dike.

Construction of upstream reservoirs for flood control is a viable solution to the flood problem at Fort Kent and has been incorporated in the proposal for multi-purpose dams and reservoirs at Dickey and Lincoln School, Maine. However, because of the controversy associated with construction of this multi-million dollar project and past history of continued delays, it is not considered prudent or equitable to delay the construction of local flood protection at Fort Kent which is justified, soley on the basis that "someday" the Dickey and Lincoln School Dams would be constructed.

Alternative alignments and structures for the local protection works were explored. These included:

1. A concrete gravity wall and vehicular gate structure to be utilized as a cut off at the upstream end of the project, in lieu of the earth dike along the riverbank upstream of the International Bridge.

2. A concrete gravity wall at the downstream end of the project to prevent flooding from the Fish River, in lieu of raising the existing roadway.

An analysis was made to determine if the main dike structure, downstream from the International Bridge could be relocated 20 to 30 feet closer to the river than the proposed plan. This plan would have reduced the land taking requirements, but it was determined that the project cost would increase by over $100,000. The proposed dike alignment is considered to be the most equitable and has a minimum encroachment on the river.

In addition to the analysis of various alignments, several top of dike elevations were investigated. Initially a top of dike elevation at 516 feet m. s. l. was proposed on the basis that the project would give suitable interim protection until such time as the upstream dams were constructed. After the May 1973 flood, the elevation was revised to 518 feet m. s. l. in order to provide two feet of freeboard over the record flood level at the International Bridge. However, the frequency of this flood was estimated to be in the range of 15 to 20 years. In order to provide 100 year flood protection, the top of dike elevation was raised to 521.5 feet, m. s. l. upstream of the International Bridge and to 520 feet m. s. l. near the Fort Kent Blockhouse. This top of dike elevation was compatable with the record ice-jam flood level that occurred during May 1974.

SELECTING A PLAN

The selection of the best plan for local flood protection at Fort Kent involved a comparison of all alternatives considered. The proposed plan satisfies formulation and evaluation criteria and provides for an economically justified project which meets the needs and desires of local interests. Economic studies to optimize excess benefits for the proposed project alignment were made considering design flood elevations at the International Bridge of 516, 519, and 522 feet, mean sea level. These studies indicate that maximization of benefits would be achieved with a project having a top of protection at elevation 521 feet, mean sea level, including freeboard, which would provide protection against floods up to a 100-year frequency. The results of these studies are shown in Table 3 and the curve of excess annual benefits vs. elevation of top of protection. In addition to economic factors, all environmental aspects and impacts of the project have been evaluated.

Consideration of all these factors has resulted in the selection of a plan of improvements that includes an earth fill dike with stone slope protection extending from above the International Bridge to a point near the Fort Kent Blockhouse, a pumping station and interior drainage facilities, a pressure conduit and a raised roadway along the Fish River.

The Selected Plan

PLAN DESCRIPTION

The proposed local flood protection project at Fort Kent provides for the construction of 3245 linear feet of earth dike, a pumping station and appurtenances, a pressure conduit and a raised roadway at Blockhouse Road.

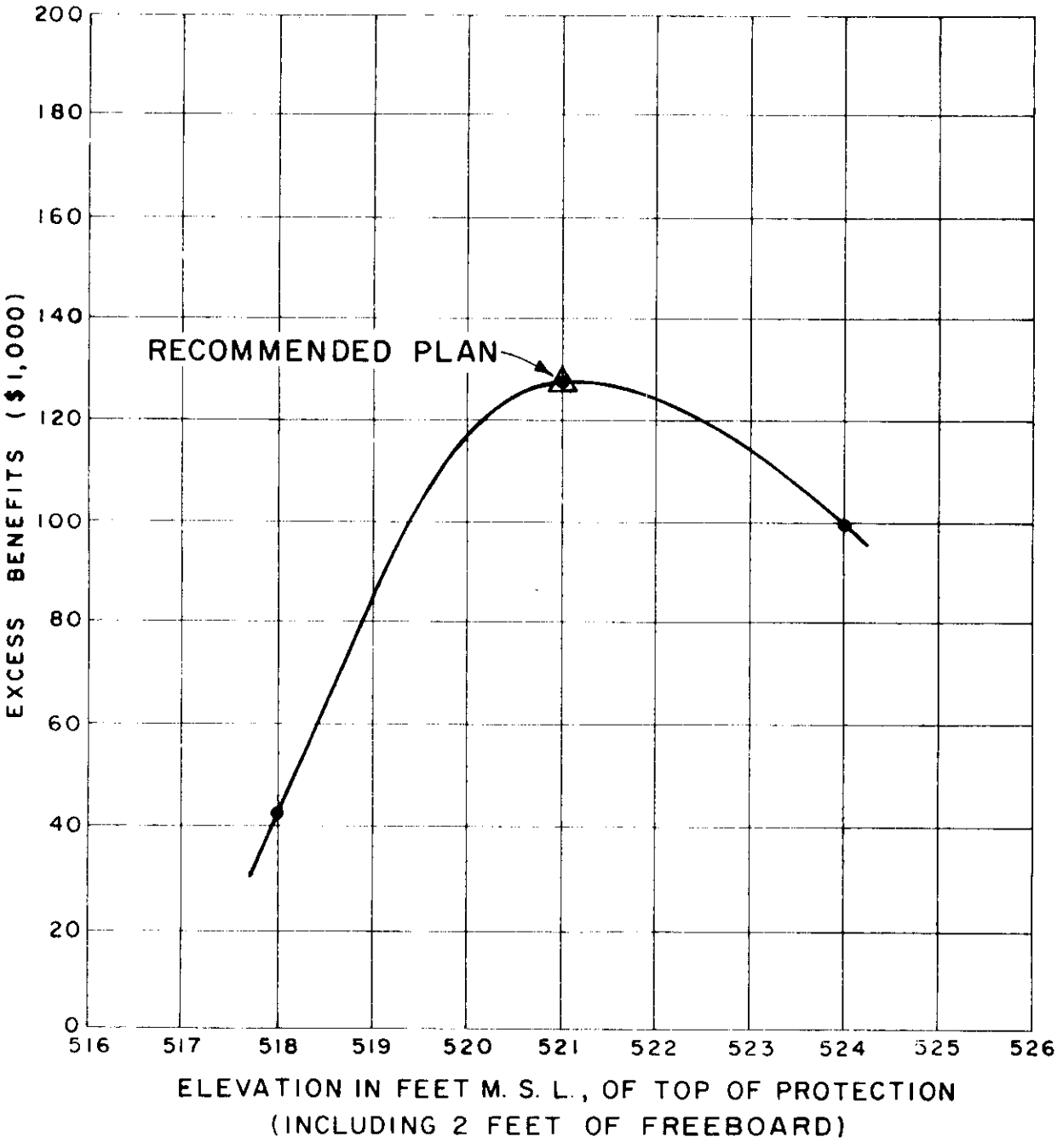
TABLE 3

EXCESS BENEFITS

At International Bridge

Design Flood Elevation	Top of Protection Elevation	Total First Cost	Annual * Cost	Annual Benefit	B/C Ratio	Excess Benefit Over Cost
516	518	$1,234,000	$ 79,900	$122,000	1.5	$ 42,100
519	521	$1,555,000	$ 100,000	$225,041	2.3	$125,041
522	524	$2,650,000	$ 168,200	$267,800	1.6	$ 99,600

* Based on an interest rate of 5-7/8 percent and a project life of 50 years.



FORT KENT LOCAL PROTECTION

EXCESS BENEFITS CURVE

NOVEMBER 1974

The earth dike would extend from high ground, about 950 feet upstream of the International Bridge, to an existing embankment near the Fort Kent Blockhouse. The top elevation would slope from Elevation 521.5 feet, mean sea level at the upstream end to elevation 520 feet, mean sea level at the downstream end. The alignment of the dike behind residential and commercial buildings along Main Street and Meadow Lane would generally parallel the existing riverbank so as to provide a balanced encroachment on both the land and river. The dike would consist principally of compacted impervious and random earth fills with an 18 inch thick layer of stone slope protection on 12 inches of gravel bedding on the riverside slope. The landside slope would be provided with six inches of topsoil and would be seeded. The slopes would be 2.5 horizontal to 1 vertical and 2 horizontal to 1 vertical on the riverside and landside, respectively. A three foot thick layer of stone would be placed on dumped gravel fill to stabilize the riverside toe of the dike.

The pumping station would have a discharge capacity of 30 c.f.s. to handle interior drainage from 62 acres of developed land behind the protection works. The building would be located on the landside toe of the dike at the rear of property owned by Daigle American Motors. The structure would house two axial flow pumps, and would be driven by vertical diesel powered engines. Each pump will have a capacity of 20 c.f.s., which is two-thirds of the required station capacity.

The overland flow of local runoff which would normally discharge into the Saint John River would be trapped behind the proposed dikes. This would necessitate installation of a gravity flow storm drain system located behind the dike, extending to a point of discharge at the new pumping station. Manholes and inlets would be located to prevent any build up of water behind the dikes. Flow through the drains would normally be by gravity, but during flood periods the gravity outfall would be closed by means of a flap gate and sluice gate. With the gates closed, interior drainage would be pumped over the dike and into the river. A 48' inch pressure conduit would be provided at the upstream end of the project to discharge interior runoff from the hills in this area. Some of the drainage would be diverted into the pressure conduit in order to reduce pumping capacities at the proposed pumping station.

About 550 linear feet of Blockhouse Road, extending along the Fish River from Main Street to near the Blockhouse would be raised an average of 3 to 5 feet to elevation 518 feet, mean sea level. The embankment would be along the alignment of the existing roadway and would be composed of impervious earth fill. The top width would be 16 feet while the paved surface would be 12 feet wide. A guard rail would be provided along the river edge of the raised embankment. Because river velocities would be minimal in this area, both slopes (1 horizontal to 2 vertical) would be topsoiled and seeded.

Plans, profiles, and sections of the proposed work are shown on Plates 1 through 7 of the report.

PLAN ACCOMPLISHMENTS

The proposed plan of improvements would result in the reduction of existing and future damages to the commercial center of Fort Kent. All damages up to the 100 year event would be prevented in the area upstream of the Saint John-Fish River confluence. Construction of the project would stimulate the economy of the Town by increasing the local labor market and by providing increased business for local merchants.

In the past, local property owners have been hesitant to improve their buildings and increase their inventory because of the flood threat. Construction of the project would allow for these improvements by eliminating the threat of flooding. From a social standpoint the plan would prevent the anxiety associated with floods and threats of floods that occur each spring.

By extending the dike along the river, upstream of the International Bridge, the improvement not only allows for reconstruction of the existing inadequate GSA Border Station, but also would lower costs for such a facility by eliminating the need for extensive site work along the riverbank. This alternative would also permit free flow of traffic along Main Street during flood periods, whereas construction of a vehicular gate structure in lieu of the dike would have necessitated the detour of vehicles, including large trucks, over local back roads. Disruption of traffic has been a major problem during past flood periods.

EFFECT ON ENVIRONMENT

The primary effect of the proposed plan would be the flood protection afforded to 48 acres of residential and commercial property at Fort Kent. A secondary effect would be increased land use of existing undeveloped lands. Removal of the flood threat would enhance not only the quality of the human environment, but also the local economy and spare the citizens of Fort Kent the added stress of vacating the center of their shopping area.

There would be no effect on the fishery resource of the Saint John River either during or after construction of the project, as excavation of riverbottom materials will not be necessary and placement of gravel fill on the existing gravel river bottom will not result in siltation of the river.

A report of the U. S. Fish & Wildlife Service is included in Appendix 2 and states that environmental impacts associated with the project are expected to be minimal. In addition, they have recommended that the project be constructed as planned. At the present time, the site of the proposed project is utilized for parking vehicles, cylinder gas loading and distribution area for existing stores. The area is generally run down and the construction of the dike would enhance the overall esthetic conditions along the riverbank. About 50% of the large elm trees that will have to be removed are dead or dying from "Dutch Elm" desease and their removal will also have a beneficial environmental effect.

Detailed Analysis of all aspects of environmental considerations concerning the selected plan of improvements is included in the draft Environmental Impact Statement prepared in accordance with the National Environmental Policy Act of 1969.

Comments on the draft Environmental Impact Statement were requested from:

Department of Interior
Environmental Protection Agency
U. S. Fish & Wildlife Service
Department of Housing and Urban Development
Department of Commerce
Advisory Council on Historic Preservation

Department of Health, Education and Welfare
National Foundation for Environmental Control
Marine Resources Committee
Environmental Information Center
Committee on the Atlantic Salmon Emergency
Sierra Club
Environmental Impact Commission
Maine Association of Conservation Commissions
Maine Historic Preservation Commission
Maine Environmental Commission
State Planning Office
State Recreation and Park Commission
Town of Fort Kent, Maine

DESIGN FEATURES

The proposed dike and appurtenant structures are designed to protect the Fort Kent Upper Village from a flood having a frequency of once in one hundred years. Incorporated in the dike design is an additional two foot freeboard zone to protect against wave action and ice overtopping. This project design flood has an estimated discharge of 175,000 c. f. s. The slope of the top of dike approximates that of the existing river and is considered to be an adequate design for the proposed project.

In order to provide a minimum impact on the existing National Historic Site of the Fort Kent Blockhouse the freeboard zone for the raised roadway along the Fish River has been deleted from the plan of improvements. During the rare occurrances of 100 year flood levels this relatively short length (580 feet) of roadway can be readily supplemented with a temporary barrier such as stoplogs or sand bags to prevent a backup of Fish River discharges. By so doing the scenic qualities of the historic site can be preserved.

MECHANICAL DESIGN

General Plate 7 shows the general arrangement of pumps and other mechanical equipment. Electric service is not considered adequately reliable at the station for electric motor drive.

Pumping Station The pumps will be driven by diesel engines through right angle gear units. The pumps will be vertical, fixed blade, propeller or mixed-flow type of standard construction using steel columns and discharge elbows; cast iron, cast steel or steel plate bowls and suction bells; cast steel or bronze impellers; stainless steel pump shafts; and bronze bearings. Each pump shall be provided with its own individual electric motor driven centralized pressure lubrication system. All pumps will be capable of operation against all river stages up to the top of the dike.

Trash racks are not required as all inlets to the drains leading to the sump are adequately screened.

Two pumps will be provided, with each pump having a capacity of 20 c. f. s. (9, 000 gpm), two-thirds of the required station capacity, against the standard project flood with suction sump at high water elevation. Each pump will discharge over the top of the dike. Two sluice gates, one located in front of each pump, will seal off the pump sump except when opened for activation of the station. Gates will be sized for an entrance velocity of approximately 2. 5 f. p. s. with all pumps operating. A sluice gate will be provided on the riverside of the dike to close off the gravity flow conduit.

Sluice Gates All sluice gates at the pumping station will be seating pressure types of standard cast iron construction with bronze seals. Electric motor-operated floorstands will be installed for operation of each gate. Floorstand will also be provided with a hand wheel for manual operation.

Sump Pump An electric motor-operated wet pit type sump pump will be provided in the pumping station for dewatering and for handling any leakage into the sump.

Heating The station will be equipped with an oil-fired warm air furnace thermostatically controlled to maintain inside temperature at 55°F. In addition, a humidistat will override the thermostat to operate the heater as necessary to maintain the relative humidity at not higher than 50%.

Ventilation A small fan with duct work will be provided for ventilation of the sump. Another fan with duct work will provide air for combustion and cooling for the air cooled diesel operated emergency generator. The pump diesel engines will be radiator cooled with each radiator connected to exterior wall louver by duct work to prevent short circuiting of cooling air. Inlet louvers will be provided for air supply to the radiators.

Water Level Indicators Indicators for both the station sump and the river water levels will be provided in the station. The sump water level indicator will also incorporate controls to provide for automatic shutdown of pump diesel engines at a predetermined sump low water level. An alarm will also be sounded at shutdown.

ELECTRICAL DESIGN

Electric Service Electric Service will be obtained from the Maine Public Service Company at 120/208V, 3-phase, 4-wire. The service will be extended from existing lines on Main Street overhead approximately 300 feet along a new access road to the pumping station.

Interior Electrical Features

a. Wiring System All conductors will have heat and moisture resistant type insulation and will be installed in rigid steel conduit.

b. Communication System Conduit will be installed for use by the New England Telephone Company to provide telephone service.

c. Emergency Lighting A battery operated emergency lighting unit will be provided.

Electric Load Data

Item	Connected Load	Demand Load
Furnace	2@ 1/3 HP	2@ 1/3
Generator Fan	1/8 HP	1/8
Sump Exhaust Fan	1/3 HP	
Grease Unit	1/3 HP	1/3
Sump Pump	1 HP	
Floor Stand	2@ 1 HP	1
Sluice Gate	2 HP	2
Lighting	2.6 KW	2.6
Receptacles	1.2 KW	
TOTAL LOADS	10.2 KVa	6.7 KVa

A 10KW, 3 phase, 4-wire 120/208, 60 hertz diesel engine generator set is proposed to handle emergency demand loads.

CONSTRUCTION

Materials from the required earth excavations will be utilized to the extent practicable in the random fill zones of the dike. Impervious fill material is available from undeveloped sources in glacial fill deposits within a five mile haul of the project site. Materials for gravel fill and bedding are available from undeveloped or inactive sources within a 20 mile haul. Rock materials are not available locally and would be obtained from commercial sources within about 70 miles. Because of the relatively small amount of concrete involved in the project, specifications would provide for the use of a manual concrete plant and ready-mixed concrete. These materials are available from the Madawaska Brick and Block Company located in Frenchville, Maine, approximately 20 miles from the project site. The project should be essentially completed within one construction season with final grading and seeding to be accomplished during the following spring.

OPERATION AND MAINTENANCE

Operation and maintenance of the entire project would be a non-Federal responsibility and would be accomplished in accordance with Federal regulations. Maintenance of the earth dike would be minimal and would include removal of debris, grass cutting and replacement of displaced rock. This could be accomplished as part of normal public works by Town employees. Maintenance and operation of the pumping station would amount to about $2,000 annually. Of this amount, about $1,000 would be necessary to operate the pumps during an assumed flood alert period of 48 hours. An operation and maintenance manual would be provided so that a public works crew could operate and maintain the pumping station. No significant problems are anticipated in connection with operation and maintenance of the selected plan.

It is anticipated that one replacement of the pump motors and miscellaneous equipment will be required during the project life. This is based on the assumption that replacement parts will not be readily available after 25 years and; therefore, the entire unit will have to be replaced. An annual cost of $1,000 is considered adequate to cover major replacements for the project.

Economics Of Selected Plan

METHODOLOGY

The tangible justification of the selected plan can be ascertained by comparing equivalent average annual costs (including interest, amortization, operation and maintenance, and major replacements) with an estimate of the average annual equivalent benefits which would be realized for the plan over a 50 year period. The economic life is believed to be reasonable, since the project would provide a very high degree of protection and would involve an urban area, vertually assuring adequate maintenance indefinately. The annual replacement costs include an amount for major repairs and rehabilitation of the levees and channels. Values of costs and benefits that would accrue to the plan at different times were made comparable by conversion to an equivalent time basis using the current Federal interest rate. An interest rate of 5-7/8 percent was used for all features of the selected plan.

COSTS

Cost estimates for construction of the proposed local protection project include a 15 percent contingincy factor as well as costs for engineering, design, supervision and administration of a construction contract. The period of analysis was selected as 50 years. Interest and amortization charges are based on an interest rate of 5-7/8 percent. Annual charges also include operation and

maintenance charges. It is estimated that no major replacements will be required during the 50 year project life. Interest during construction is not applicable because of the estimated 18 month construction period. Estimated first costs and annual charges are summarized in Table 4.

LOSSES AND BENEFITS

The primary benefit that would accrue to the dike protection plan for Fort Kent would be the reduction of future flood damages. It is estimated that a recurrence of the May 1974 record flood level would cause losses of $1.7 million under current conditions. More depth in inventory selections and improved business operations provide immediate secondary benefits. In addition, the plan would provide intangible area benefits such as improved public health, better safety measures such as police and fire protection, and improved morale to the area's habitants. Average annual flood damages prevented represent the difference between average annual flood damages that would be expected without the project and residual average annual damages which would exist under the project. These benefits amount to $208,630. Direct beneficiaries of this flood control measure are mainly the owners of the 35 houses and 60 commercial properties along with the five units of public buildings in the flood prone area of the Central Business District. Indirect beneficiaries are the entire populace of the Fort Kent Labor Market Area whose inconveniences, loss of welfare, and disruptions to normal daily pattern would be prevented. Redevelopment benefits are $16,411 and average annual total benefits are $225,041.

JUSTIFICATION

Comparison of average annual benefits with average annual costs are shown in the following tabulations for the proposed plan of improvements. Although intangible benefits are attributable to the project only tangible benefits are represented in the tabulation.

TABLE 4

ESTIMATES OF FIRST COSTS AND ANNUAL CHARGES
LOCAL PROTECTION, FORT KENT, MAINE
FIRST COST
(1974 Price Level)

Federal

DIKE

Item	Quantity	Unit	Unit Price	Amount
Site Preparation	1	Job	L. S.	$ 15,500
Excavation, Unclassified	17,000	c. y.	2.50	42,500
Compacted Impervious Fill	42,300	c. y.	2.30	97,290
Compacted Gravel Fill	5,050	c. y.	3.50	17,675
Gravel Bedding	7,700	c. y.	4.00	30,800
Stone slope Protection	13,700	c. y.	21.00	287,700
Dumped Gravel Fill	22,200	c. y.	3.00	66,600
Compacted Random Fill	24,900	c. y.	2.00	49,800
Topsoil	1,300	c. y.	6.00	7,800
Seeding	7,800	s. y.	0.50	3,900
Sub-Total				$619,565
Contingencies				93,135
TOTAL CONSTRUCTION COST - DIKE				$712,700

TABLE 4 (continued)

Federal

RAISED ROADWAY

Item	Quantity	Unit	Unit Price	Amount
Site Preparation	1	Job	L. S.	$3,000
Excavation, Unclassified	440	c. y.	2.50	1,100
Compacted Impervious Fill	1150	c. y.	2.30	2,639
Compacted Gravel Fill	300	c. y.	3.50	1,050
Topsoil	165	c. y.	6.00	990
Seeding	990	s. y.	0.50	495
Guard Rail	530	L. F.	6.00	3,180
Bituminous Concrete	145	ton	30.00	4,350
Sub-Total				$16,804
Contingencies				2,496
TOTAL CONSTRUCTION COST - RAISED ROADWAY				$19,300

TABLE 4 (continued)

Federal

INTERIOR DRAINAGE

Item	Quantity	Unit	Unit Price*	Amount
12" R. C. Pipe	60	l. f.	$11. 00	$ 660
15" R. C. Pipe	445	l. f.	13. 00	5, 785
18" R. C. Pipe	145	l. f.	15. 00	2, 175
21" R. C. Pipe	195	l. f.	17. 50	3, 412
24" R. C. Pipe	125	l. f.	18. 50	2, 312
27" R. C. Pipe	1525	l. f.	22. 00	33, 550
30" R. C. Pipe	20	l. f.	24. 00	480
24" Sluice Gate & Structure	1	ea.	10, 000	10, 000
24" Flap Valve	1	ea.	1, 800	1, 800
Drainage Manholes	13	ea.	1, 000	13, 000
16" D. I. Pipe	80	l. f.	20. 00	1, 600
16" Sluice Gate & Structure	1	ea.	10, 000	10, 000
24" Culvert	40	l. f.	22. 00	880
Sub-Total				$85, 654
Contingencies				12, 846

TOTAL CONSTRUCTION COST - INTERIOR DRAINAGE $98, 500

*Unit Prices for Pipes and Culverts include installation

TABLE 4 (continued)

Federal

PUMPING STATION

Item	Quantity	Unit	Unit Price	Amount
Structural Excavation	300	c. y.	4. 00	$ 1, 200
Earth Backfill	150	c. y.	5. 00	750
Reinforced Concrete	200	c. y.	180. 00	36, 000
Superstructure	1	Job	L. S.	40, 000
Pumps & Engines	2	ea.	22, 000	44, 000
48" Sluice Gate & Structure	1	ea.	22, 000	22, 000
48" R. C. Pipe	100	l. f.	44	4, 400
48" Flap Valve	1	ea.	3, 200	3, 200
36" Sluice Gates	2	ea.	3, 800	7, 600
Outlet Headwall	1	ea.	5, 000	5, 000
18" Coated Steel Pipes	240	l. f.	55, 000	13, 200
Electrical	1	Job	L. S.	3, 500
Standby Diesel Generator	1	Job	L. S.	6, 000
Miscellaneous	1	Job	L. S.	4, 000
Sub-Total				$190, 850
Contingencies				28, 650
TOTAL CONSTRUCTION COST - PUMPING STATION				$219, 500

TABLE 4 (continued)

Federal

PRESSURE CONDUIT

Item	Quantity	Unit	Unit Price	Amount
Site Preparation	1	Job	L. S.	$ 1, 000
48" R. C. Pipe, Installed	350	l. f.	$50. 00	17, 500
Inlet Headwall	1	ea.	5, 000	5, 000
Outlet Headwall	1	ea.	5, 000	5, 000
48" Sluice Gate & Structure	1	ea.	22, 000	22, 000
48" Flap Valve	1	ea.	3, 200	3, 200
Grading @ Inlet Headwall	1	Job	5, 000	5, 000
Remove & Repair Rt. 161	1	Job	1, 500	1, 500
30" R. C. Pipe	300	l. f.	27. 00	8, 100
Street Grate @ James St.	1	ea.	1, 500	1, 500
Inlets	2	ea.	1, 000	2, 000
Sub-Total				$71, 800
Contingencies				11, 200

TOTAL CONSTRUCTION COST - PRESSURE CONDUIT $83, 000

TABLE 4 (continued)

Total Construction Cost	$1,133,000
Engineering and Design	90,000 (1)
Supervision and Administration	132,000
TOTAL ESTIMATED FEDERAL FIRST COST	$1,355,000

(1) Does not include $92,000 for preauthorization studies.

NON-FEDERAL COST

Lands and Damages	$ 195,000
Utility Relocations	5,000
TOTAL ESTIMATED NON-FEDERAL FIRST COST	$ 200,000
TOTAL ESTIMATED PROJECT FIRST COST	$1,555,000

ANNUAL CHARGES

Federal

Interest & Amortization (.06234 x $1,355,000)	$84,500

Non-Federal

Interest & Amortization (.06234 x $200,000)	12,500
Operation & Maintenance	2,000
Major Replacement	1,000
TOTAL ANNUAL COST	$100,000

TABLE 5

AVERAGE ANNUAL COSTS AND BENEFITS

Item	Flood Control	Area Redevelopment	Total
Annual Costs	$100, 000		$ 100, 000
Annual Benefits	$ 208, 630	$ 16, 411	$ 225, 041
Benefit/Cost Ratio	2. 10 to 1. 0		2. 3 to 1. 0

Project costs have also been amortized over 10, 25 and 100 year periods and equated against comparible project benefits. The following information indicates a comparison of costs and benefits for various amortization periods.

Amortization Period	Annual Cost	Annual Benefit	B/C Ratio
10 years	$212, 900	$225, 041	1. 06
20 years	137, 100	225, 041	1. 6
50 years	100, 000	225, 041	2. 3
100 years	94, 600	225, 041	2. 4

Division Of Plan Responsibilities

FEDERAL RESPONSIBILITIES

The Federal government (Corps of Engineers) would design and prepare contract plans, as well as advertise for the construction of the proposed project upon receipt of approval and funding by the Chief of Engineers. There are no cost sharing features included in this Section 205 project.

NON-FEDERAL RESPONSIBILITIES

Under criteria for special continuing authorities non-Federal interests must:

1. Provide without cost to the United States all lands, easements, rights-of-way, utility relocations and alterations, and highway or highway bridge construction and alterations necessary for project construction.

2. Hold and save the United States free from damages due to the construction works, except where such damages are due to the fault of the United States or its contractors.

3. Maintain and operate the project after completion, without cost to the United States, in accordance with regulations prescribed by the Secretary of the Army.

4. Assume full responsibility for all project costs in excess of the Federal cost limitation of $2 million (areas being declared disaster areas within the previous five years).

5. Prevent future encroachment which might interfere with proper functioning of the project for flood control.

6. Comply with the requirements specified in Section 210 and 305 of Public Law 91-646, approved 2 January 1971, entitled "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970".

7. At least annually, notify local citizens that the project does not provide complete flood protection (i. e. beyond the 100 year event)

These items of local cooperation were discussed at a public meeting held at Fort Kent on 14 May 1973, and at subsequent meetings with town officials. A letter stating their intent to provide local assurances is contained in Appendix 2 of this report.

View Of Non-Federal Interests

The considered plan of improvement was coordinated with the following non-Federal interests:

International Joint Commission
Maine Soil & Water Conservation Commission
Maine State Planning Office
Canadian Department of Energy, Mines & Resources
Town of Fort Kent

Letters of comment and concurrence from responding agencies are included in Appendix 2 of this report along with letters from local and State officials, as well as the Governor of Maine. Their response indicates the need for flood protection at Fort Kent and general approval of the proposed plan of improvement. The Maine State Planning Office requested that a plan of flood plain evacuation be evaluated. This plan was selected as The Environmental Quality Plan but did not satisfy the economic criteria and was not acceptable to the local community.

A public meeting was held at Fort Kent on 14 May 1973 to provide opportunity for local citizens, as well as governmental spokesmen, to express opinions on the matter of flood control at Fort Kent. The meeting was well attended and those that spoke had favorable comments for a plan of local flood protection, similar to that described herein. Subsequent meetings with the Fort Kent Town Manager and Town Council have provided active local support to the extent that a committee of businessmen have volunteered to work, on behalf of the town, in securing lands required for the project. A digest of the public meeting is included in Appendix 3 of the report.

Review By Other Federal Agencies

The considered plans of improvement were coordinated with the following Federal agencies:

Fish and Wildlife Service
Soil Conservation Service
Environmental Protection Agency
General Services Administration
Advisory Council on Historic Preservation

Letters received from responding agencies, expressing their views and recommendations, are contained in Appendix 2 and are summarized below:

1. The United States Fish and Wildlife states that environmental impacts from the project are expected to be minimal due to low potential for wildlife in the area and recommend that the project be constructed as planned.

2. The Advisory Council on Historic Preservation requests coordination with State Historic Preservation Officer.

Plan Implementation

The steps necessary to follow in realizing the construction of local flood protection measures at Fort Kent are summarized as follows:

1. Review and approval of this report by the Office of the Chief of Engineers

2. Receipt of funding for plans and specifications and construction of the project

3. Submission of final Environmental Impact Statement through channels to Council for Environmental Quality (CEQ)

4. Notification of project approval and request for comments from the Governor of Maine

5. Receipt of formal local cooperation agreements from the Town of Fort Kent and the State of Maine

6. Complete plans and specifications and advertise for bids

7. Open bids and award a construction contract

Because of the severity and increasing frequency of flooding at Fort Kent and due to the relatively short construction season, initiation of the contract is scheduled for June 1975, with the project to be completed within an 18 month period.

Summary

The commercial center of Fort Kent has been devastated by record flooding during the spring of 1973 and again during the spring of 1974. This flooding has occasioned widespread physical losses and hardship to the people of this northern Maine community. Our detailed investigation has shown the need and justification for construction of local flood protection at Fort Kent. Various plans and dike alignments were considered. The most feasible plan having economic justification has been reported herein and includes 3250 linear feet of earth dike, extending from upstream of the International Bridge to near the Fort Kent Blockhouse, as well as a pumping station, interior drainage facilities, pressure conduit, and a raised roadway along the Fish River. The total first cost of this plan would be $1,555,000 with annual charges and benefits equal to $100,000 and $225,041, respectively. The overall benefit-cost ratio is 2.3 to 1.0.

Environmental effects of the proposed works have been evaluated. Because the project would be constructed within the central businesses district, little loss of bird and wildlife habitat is expected. Several large, deseased trees will be removed which will be a beneficial effect. Minor siltation due to placement of dumped gravel fill and rock in the river will occur during construction of the dike but this will be of short duration. Remaining detremental effects would be offset by environmental gains produced by the flood control works.

The plan is acceptable to local interests and State officials. They have expressed their desire for construction of the project and indicated their willingness to provide local cooperation agreements.

Statement Of Findings

In the light of the overall public interests, the documents concerning the proposed action, as well as the stated view of other interested agencies and the concerned public, relative to the various practicable alternatives in accomplishing local flood protection along the Saint John River at Fort Kent, Maine have been reviewed and evaluated. The possible consequences of these alternative have been studied for environmental, social well-being and economic effects, including regional and national development and engineering feasibility. During evaluation of the selected plan and other viable alternatives, the following points were considered pertinent:

a. Environmental Considerations

From an environmental standpoint, the selected plan will afford more enhancement than adverse effects. The recommended project will have beneficial effects on flood control, and the environmental setting. Only minimal vestiges of the existing environment will be changed by the proposed plan. This includes removal of several large elm trees, many of which are deseased, and obstruction of the riverview, due to the height of the dike above the existing riverbank.

b. Social Well-Being Considerations.

The overriding social well-being consideration for the people of the Town of Fort Kent is the elimination of the flood hazard to their homes and incidental health problems that occur during and subsequent to flood periods. The recommended project will provide a high degree of protection resulting in greater security for people in the flood zone and reduce anxieties now experienced due to the threat of flooding.

c. Engineering Considerations.

From an engineering standpoint the selected project will provide the highest degree of protection at the least cost. Considerations were given to increasing and/or decreasing height of protection

to determine the plan which maximized flood control benefits. Other project alternatives, including non-structural measures, were considered. These included:

1. Evacuation of the flood plain
2. Upstream dam and reservoir construction
3. Concrete flood walls
4. Flood proofing of existing buildings

Alternatives plans did not meet the criteria and requirements for various economic, social, and environmental reasons. The selected plan provides protection against a recurrence of record flood levels and provides the least social and environmental impact on the project area.

d. Economic Considerations.

From an economic standpoint the selected plan is sized at the optimum economic capacity providing a high degree of flood protection which will be conducive to the preservation of the social well-being of the community. The recommended project will have a net effect of increasing land values and will preserve and stimulate growth in the protected area. During the construction period it will increase the the local labor market by affording jobs for local citizens.

e. Other Public Interest Considerations.

The desires of the State of Maine and the people of the Town of Fort Kent are reflected in this proposal. The project is feasible and economically justified based on a combination of tangible and intangible benefits. The flood control improvements will enhance the social well-being and economic and environmental aspects of the area. Local interests and State officials have indicated strong support for the project and early implementation of the construction works.

The action proposed, as developed in this report is based on thorough analysis and evaluation of various practicable alternative courses of action for achieving the stated objectives; that wherever adverse effects are found to be involved they cannot be avoided by following reasonable alternative courses of action which would achieve the specified purpose; that where the proposed action has an adverse

effect, this effect is either ameliorated or substantially outweighed by other considerations of national policy; that the recommended action is consonant with national policy, and administrative directives, and that on balance the total public interest should best be served by the implementation of the recommendation.

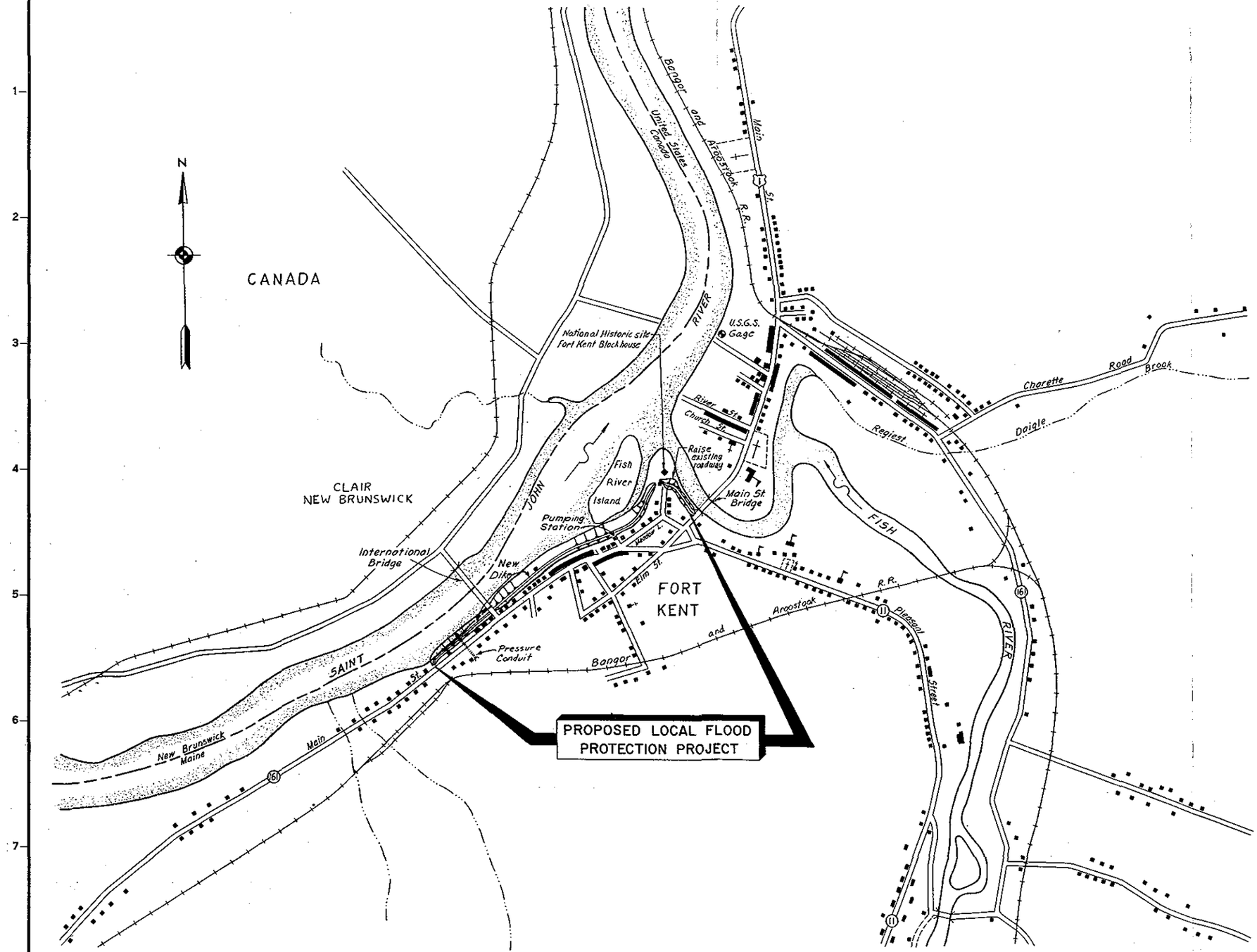
Recommendations

It is recommended that the earth dike and appurtenant structures described as the selected plan in this report be authorized by the Chief of Engineers under authority of Section 205 of the 1948 Flood Control Act, as amended, and that additional funds in the amount of $90,000 be allotted for preparation of plans and specifications. Upon receipt of properly executed local cooperation agreements, funds for construction will be requested. It is estimated that funds in the amount of $50,000 would be required to award a contract during Fiscal Year 1975 and that approximately $1,215,000 should be allocated to complete construction during Fiscal Year 1976.

JOHN H. MASON
Colonel, Corps of Engineers
Division Engineer

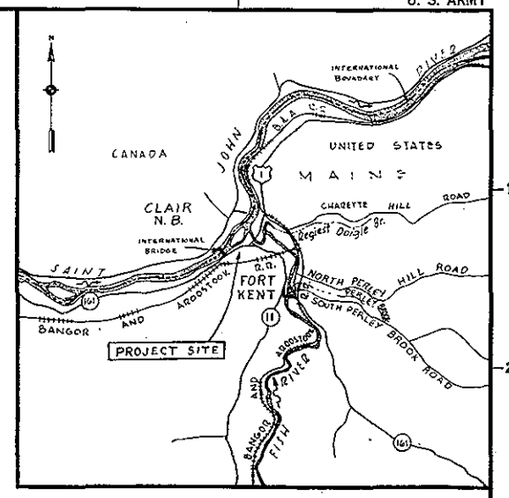
CORPS OF ENGINEERS

U. S. ARMY



PROJECT PLAN

SCALE: 1" = 500'



LOCATION MAP

SCALE: 1" = 1 MILE (APPROX.)

GRAPHIC SCALES

1" = 500' (500' 0 500' 1000')

1" = 1 MI. (APPROX) (1 MI. 0 1 MI. 2 MI.)

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY C.T.M. | CK. BY

SUBMITTED: CHIEF, SECTION

REVIEWED: PROJECT ENGINEER

APPROVED: CHIEF, DESIGN BRANCH

APPROVED DATE CHIEF, ENGINEERING DIVISION

WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE

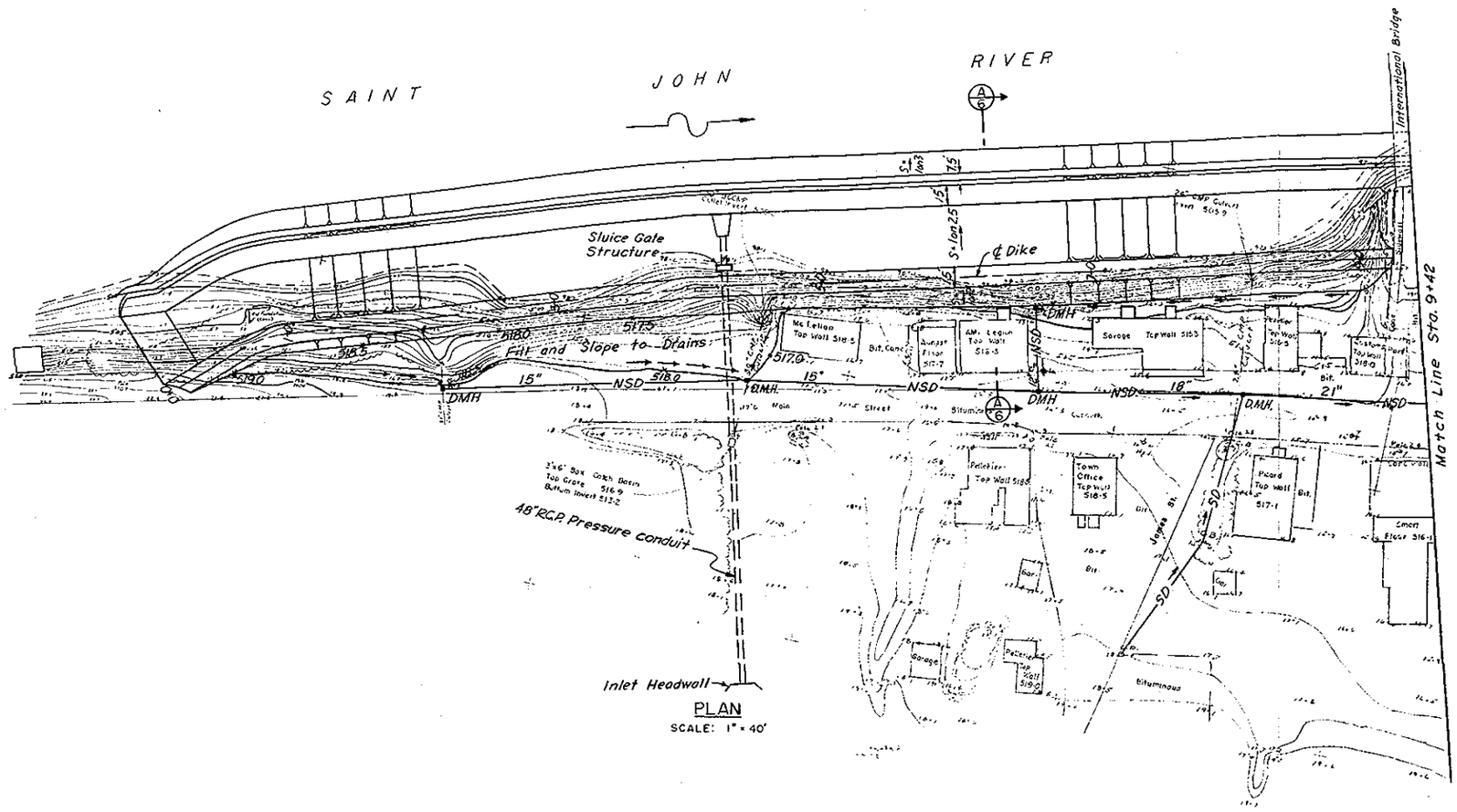
LOCAL PROTECTION PROJECT
PROJECT PLAN

SAINT JOHN RIVER MAINE

SCALE | SPEC. NO. | DRAWING NUMBER

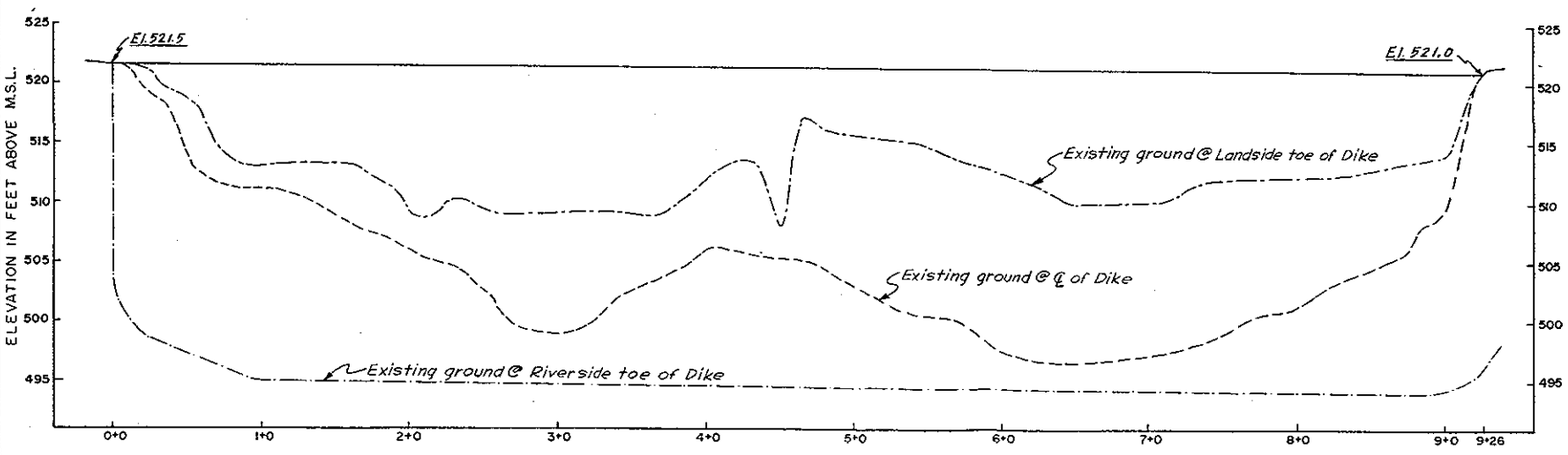
SHEET 1

PLATE 1



PLAN

SCALE: 1" = 40'



PROFILE OF DIKE ALONG SAINT JOHN RIVER

SCALE: HORIZ 1"=40'
VERT 1"=5'

LEGEND		
EXIST.	NEW	DESCRIPTION
—SD—	—NSD—	Storm Drain
	DMH ■	Drain Manhole
	DI ■	Drain Inlet
	—SS—	Sonitary Sewer
	FD ●	Foundation Exploration
	FT ▬	Foundation Trench

GRAPHIC SCALES

1"=40' 40' 0 40' 80'

1"=5' 5' 0 5' 10'

SAFETY PAYS

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY JAP | CK. BY

SUBMITTED:

CHIEF, SECTION

APPROVAL RECOMMENDED:

CHIEF, TECH. OPNS. BRANCH

APPROVED:

PROJECT ENGINEER

APPROVAL RECOMMENDED:

CHIEF BRANCH

WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE

LOCAL PROTECTION PROJECT
GENERAL PLAN NO. 1 AND PROFILE

SAINT JOHN RIVER MAINE

APPROVED DATE

CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO.

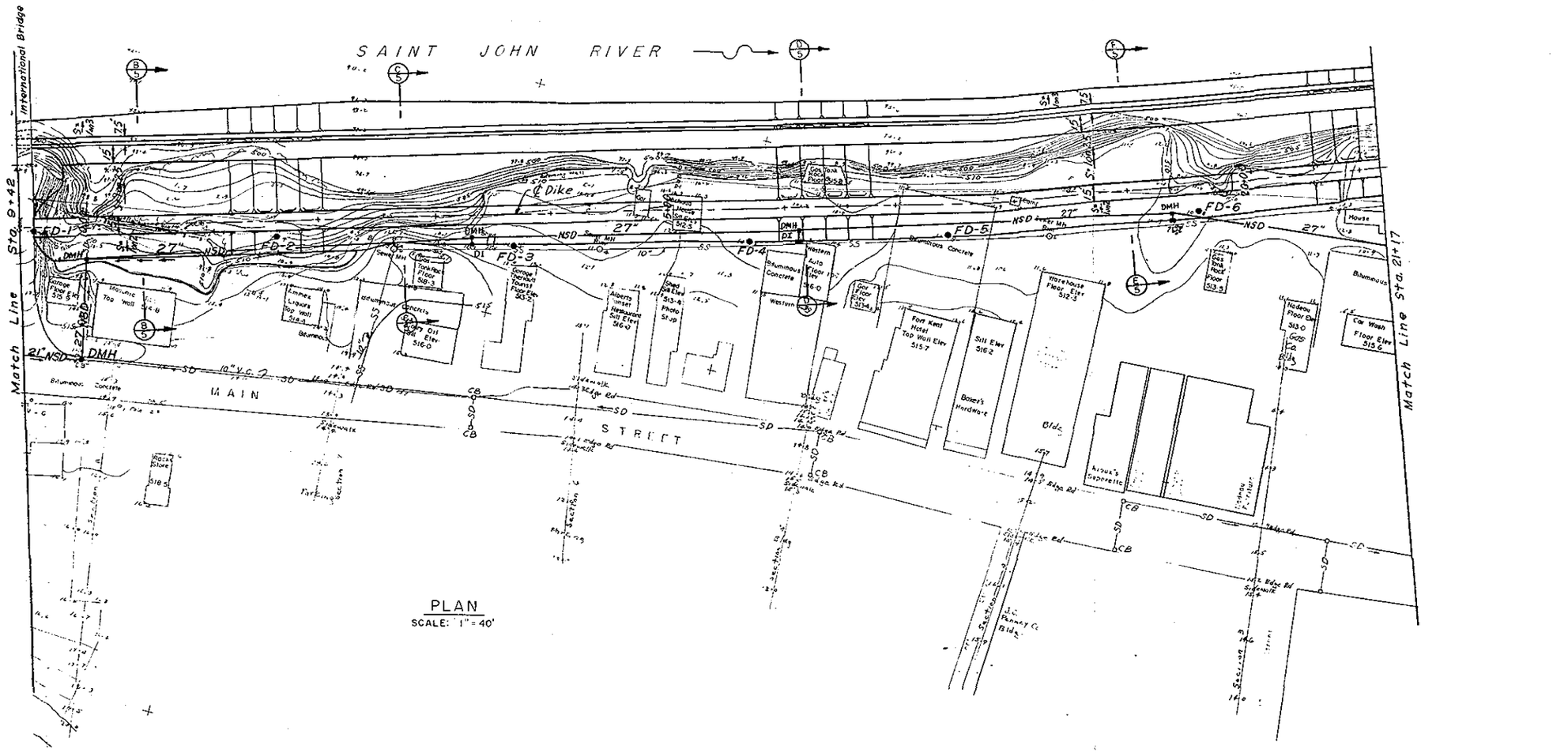
DRAWING NUMBER

SHEET

PLATE 2

CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE: 1" = 40'

GRAPHIC SCALES

SAFETY PAYS

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY | CK. BY

SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, ENGR. BRANCH
REVIEWED:
PROJECT ENGINEER
APPROVAL RECOMMENDED:
CHIEF BRANCH

WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE

LOCAL PROTECTION PROJECT
GENERAL PLAN NO. 2

SAINT JOHN RIVER MAINE

APPROVED DATE
CHIEF, ENGINEERS DIVISION

SCALE | SPEC. NO.
DRAWING NUMBER
SHEET

PLATE 3

CORPS OF ENGINEERS

U. S ARMY

SAINT JOHN RIVER

FISH RIVER

Concrete Headwall

48" Gravity Outlet

Sluice Gate Structure

New 16" D.I. Pipe

16" Sluice Gate Structure

Pumping station (For details see Plate 7)

Proposed 18" RCP culvert.

Sluice Gate Structure

Match Line sta 21+00

Main Street

Main Street Bridge

PLAN
SCALE: 1"=40'

GRAPHIC SCALES
1"=40' 40' 0 40' 80'

SAFETY PAYS

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

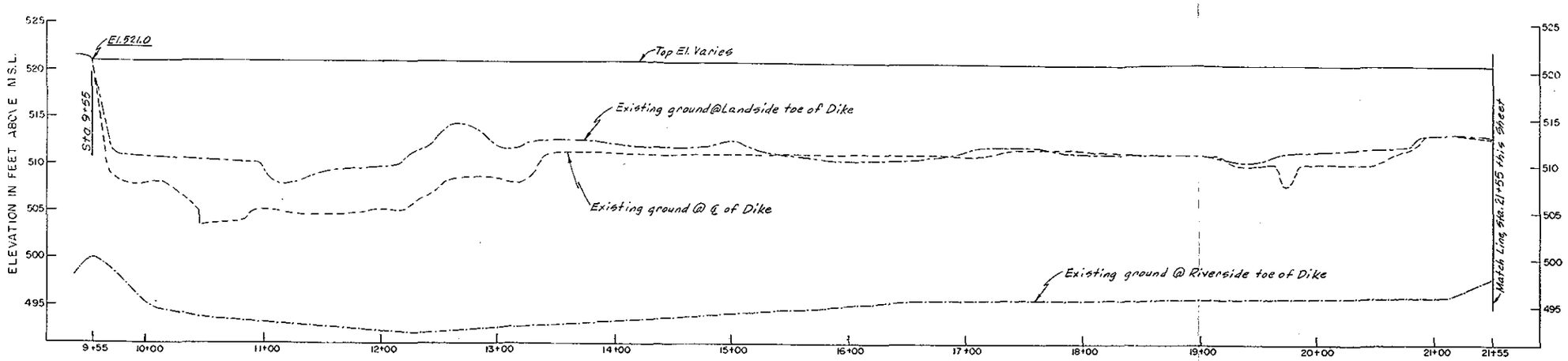
WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE
LOCAL PROTECTION PROJECT
GENERAL PLAN NO.3
SAINT JOHN RIVER MAINE

APPROVED DATE
CHIEF, ENGINEERING DIVISION

SCALE SPEC. NO.
DRAWING NUMBER
SHEET

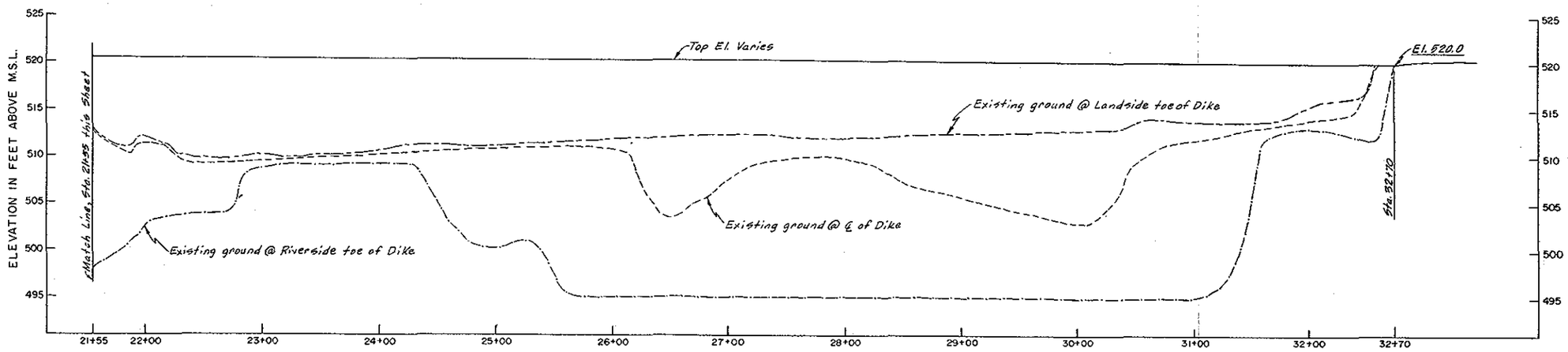
PLATE 4

CORPS OF ENGINEERS A B C D E F G H U. S. ARMY



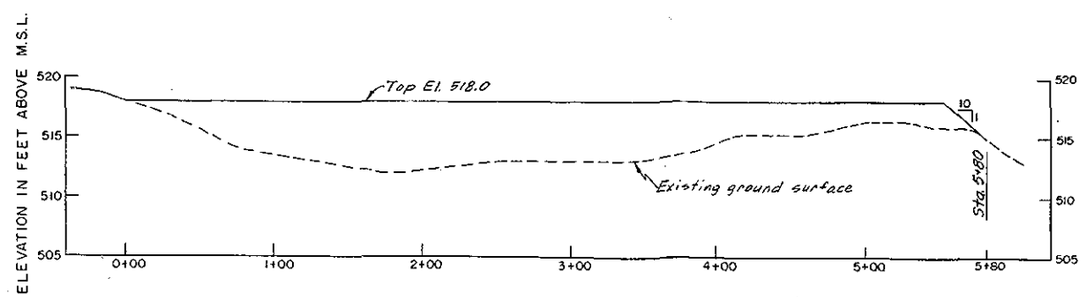
PROFILE OF DIKE ALONG SAINT JOHN RIVER

SCALE: HORIZ. 1"=40'
VERT. 1"=5'



PROFILE OF DIKE ALONG SAINT JOHN RIVER

SCALE: HORIZ. 1"=40'
VERT. 1"=5'



℄ PROFILE OF DIKE IN VICINITY OF BLOCK HOUSE

SCALE: HORIZ. 1"=40'
VERT. 1"=5'

SAFETY PAYS

GRAPHIC SCALES

1"=40' 40' 0 40' 80'

1"=5' 5' 0 5' 10'

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY

SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, HYDR. ENG. BRANCH
REVIEWED:
PROJECT ENGINEER
APPROVAL RECOMMENDED:
CHIEF BRANCH

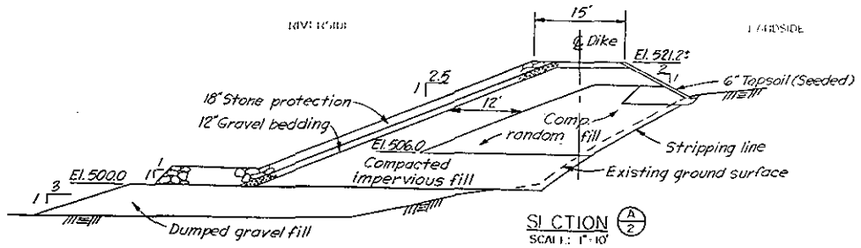
WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE
LOCAL PROTECTION PROJECT
PROFILES
SAINT JOHN RIVER MAINE

APPROVED DATE
CHIEF, ENGINEERING DIVISION

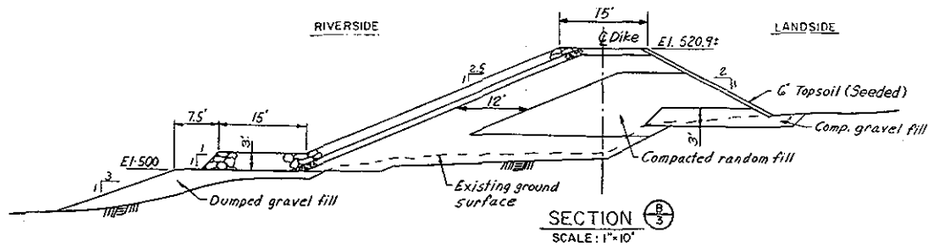
SCALE | SPEC. NO.
DRAWING NUMBER
SHEET

PLATE 5

CORPS OF ENGINEERS — U. S. ARMY



SECTION (A/2)
SCALE: 1"=10'



SECTION (B/3)
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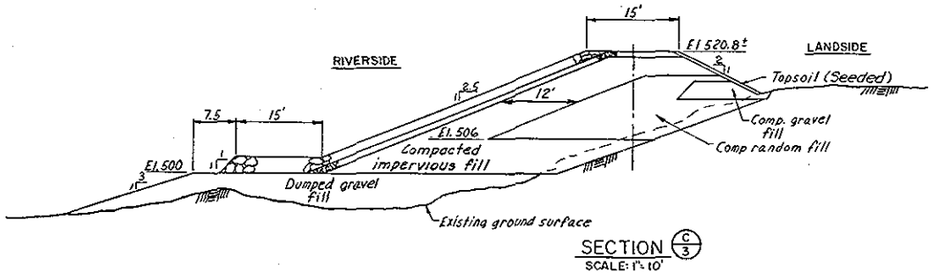

SECTION (C/3)
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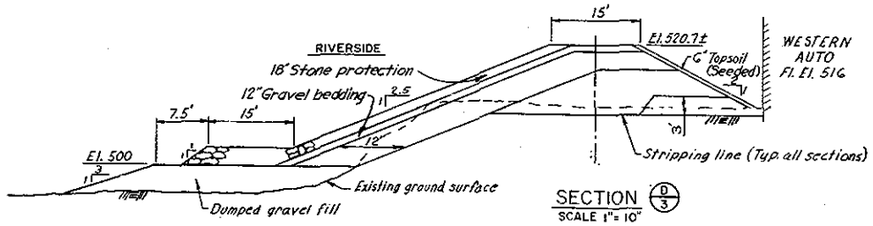
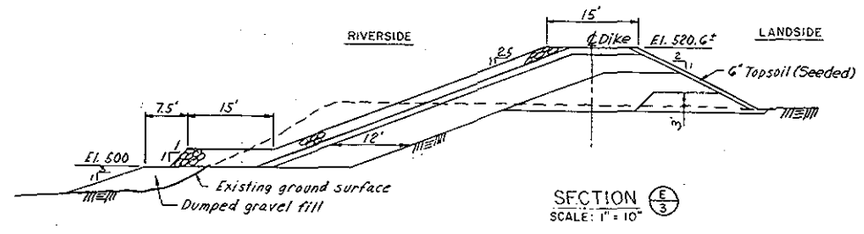
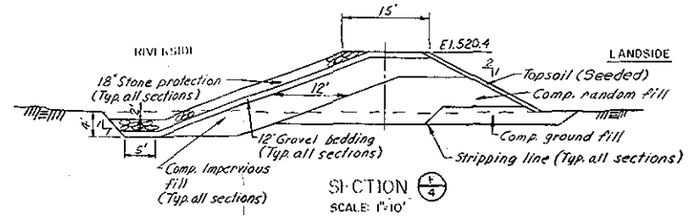


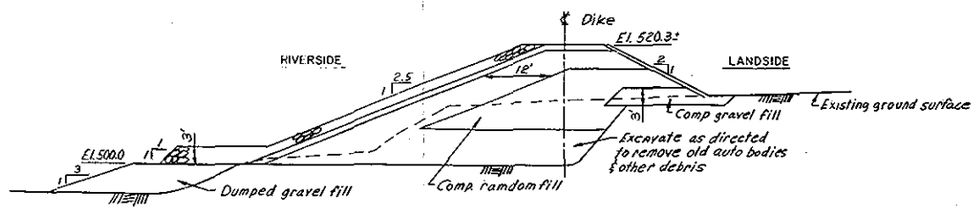
SECTION (D/3)
SCALE 1"=10'



SECTION (E/3)
SCALE: 1"=10'



SECTION (F/4)
SCALE: 1"=10'



SECTION (G/4)
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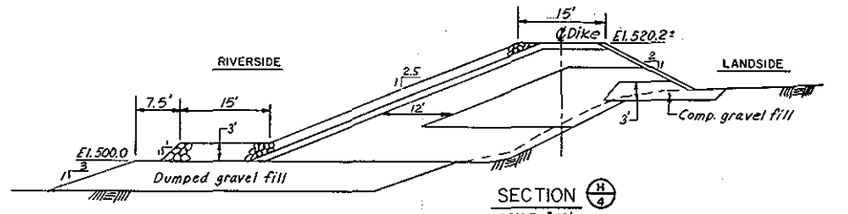

SECTION (H/4)
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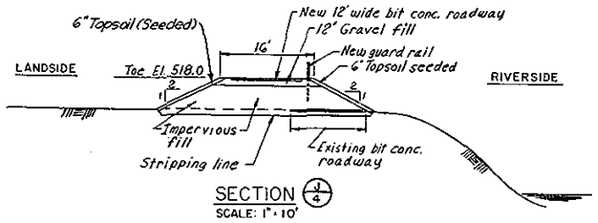
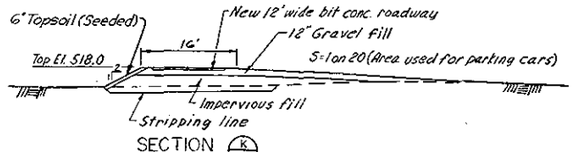


SECTION (J/4)
SCALE: 1"=10'



SECTION (K/4)
SCALE 1"=10'

SAFETY PAYS

GRAPHIC SCALES
10 5 0 10 20
1"=10'-0"
5 0 5 10
1"=5'-0"

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY W.E.S.T.	CK. BY
SUBMITTED:		
CHIEF, SECTION APPROVAL RECOMMENDED:		
CHIEF, TECH. ENG. BRANCH REVIEWED:		
PROJECT ENGINEER APPROVAL RECOMMENDED:		
CHIEF BRANCH		

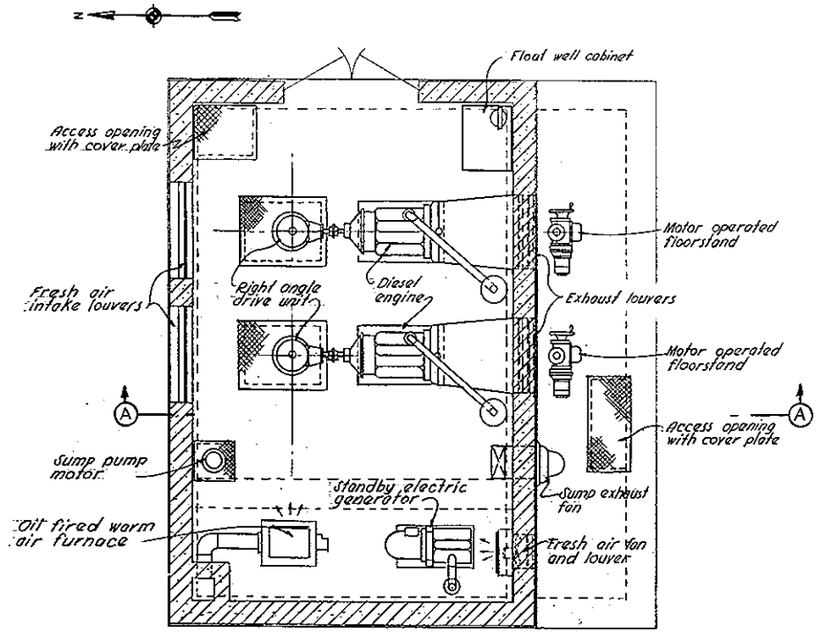
WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE
LOCAL PROTECTION PROJECT
SECTIONS
SAINT JOHN RIVER — MAINE

APPROVED — DATE
CHIEF, ENGINEERING DIVISION

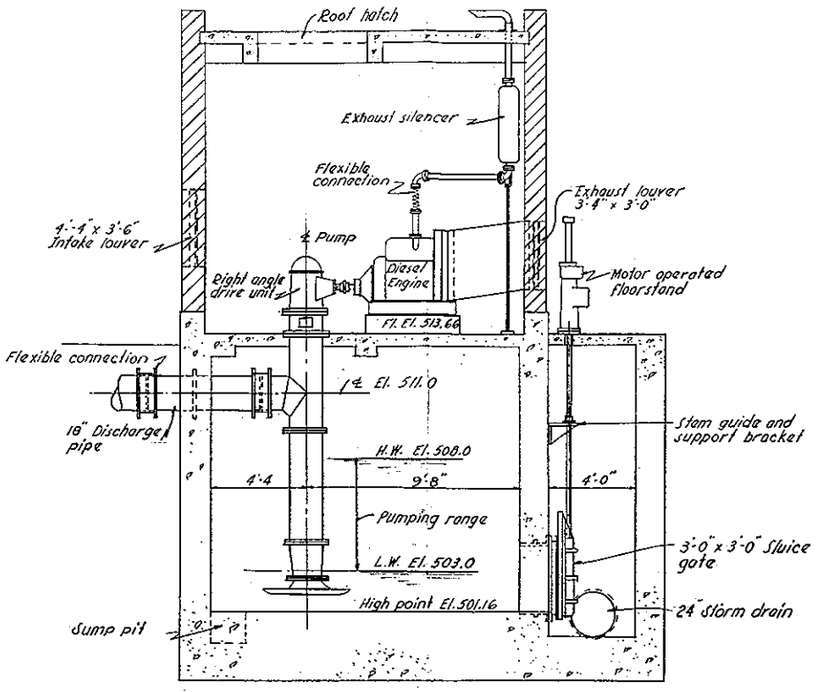
SCALE	SPEC. NO.
DRAWING NUMBER	
SHEET	

PLATE 6

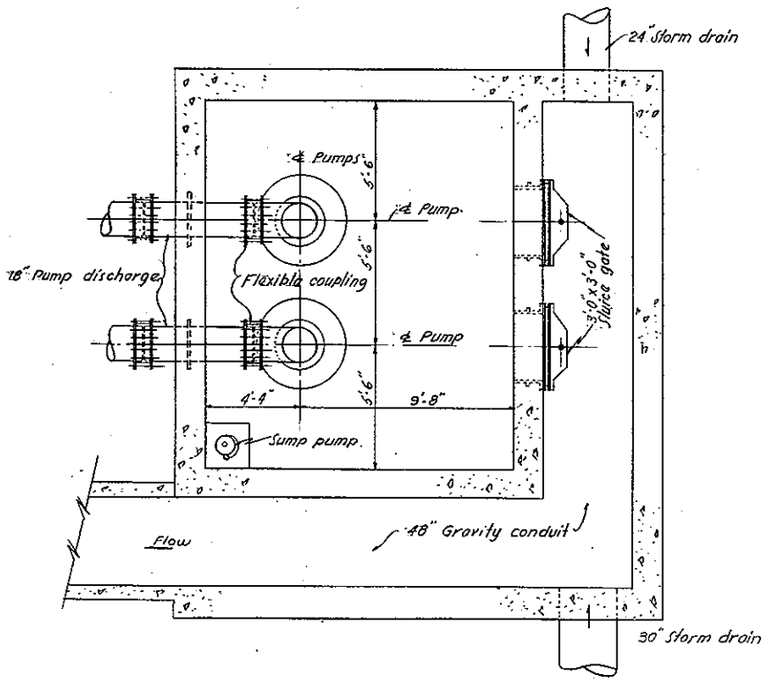
CORPS OF ENGINEERS U. S. ARMY



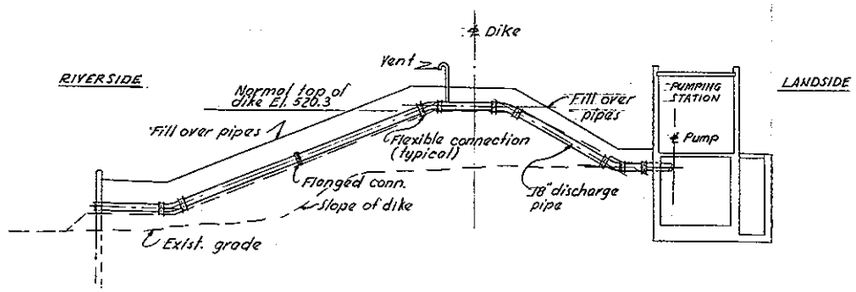
FLOOR PLAN
SCALE 3/8"=1'-0



SECTION A-A
SCALE 3/8"=1'-0"



SUMP PLAN
SCALE 3/8"=1'-0"



SECTION AT DIKE
SCALE 1"=1'-0"

SAFETY PAYS

GRAPHIC SCALES
3/8"=1'-0" 4' 2' 0 4'
1"=1'-0" 10' 0 10' 20'

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.T.S.	DR. BY J.V.	CK. BY
SUBMITTED:		
CHIEF, MECH & ELECT SECTION		
APPROVAL RECOMMENDED:		
CHIEF, STRUC. ENG. BRANCH		
REVIEWED:		
PROJECT ENGINEER		
APPROVAL RECOMMENDED:		
CHIEF PROJECT BRANCH		

WATER RESOURCES DEVELOPMENT PROJECT
FORT KENT, MAINE

LOCAL PROTECTION PROJECT
PUMPING STATION
MECHANICAL-PLANS AND SECTIONS

SAINT JOHN RIVER MAINE

APPROVED DATE
CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO.
DRAWING NUMBER

SHEET

PLATE 7

APPENDIXES

NOVEMBER 1974

FORT KENT
LOCAL PROTECTION
FORT KENT, MAINE

Detailed
Project
Report
for
WATER
RESOURCES
DEVELOPMENT

ST. JOHN RIVER LOCAL PROTECTION
FORT KENT, MAINE

DETAILED PROJECT REPORT
FOR WATER RESOURCES DEVELOPMENT

TECHNICAL REPORT

SECTION A - Hydrology & Hydraulic Design

SECTION B - Economics & Resources Analysis

SECTION C - Geology, Embankments, Foundations & Concrete

SECTION D - Real Estate

APPENDIX 1

PREPARED BY THE
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

SECTION A

HYDROLOGY AND HYDRAULIC DESIGN

ST. JOHN RIVER FLOOD CONTROL
FORT KENT, MAINE
LOCAL PROTECTION PROJECT

SECTION A - HYDROLOGY & HYDRAULICS

Table of Contents

LIST OF TABLES

LIST OF PLATES

ST. JOHN RIVER FLOOD CONTROL
FORT KENT, MAINE
LOCAL PROTECTION PROJECT

SECTION A - HYDROLOGY & HYDRAULICS

1. PURPOSE

This section presents the hydrologic and hydraulic criteria pertinent to the design of the local protection project along the St. John River at Fort Kent, Maine. Included are sections on general description, climatology, analysis of floods, design flood criteria, and interior drainage.

2. BASIN DESCRIPTION

a. General. The St. John River basin, one of the largest in North America draining to the Atlantic Ocean, is located in northern Maine and the Canadian provinces of Quebec and New Brunswick, between the watersheds of the St. Lawrence River to the north and the Penobscot River to the south. It has a total drainage area of 21,360 square miles of which 65 percent, or 14,000 square miles, lie in Canada and 35 percent, or 7,630 square miles, lie in the United States. A map of the St. John River basin is shown on plate A-1.

The town of Fort Kent is one of the most northerly communities in the United States east of the Mississippi; lying north of the 47th parallel. Historically it has served as the northern commercial trading center for the widespread agriculture and wood industry of Aroostook County, Maine. The town is located on the right bank of the Saint John River at river mile 271 and at the mouth of the Fish River tributary. The total drainage area of the St. John River at Fort Kent, including the Fish River, is 5,690 square miles or 27 percent of the total watershed of the St. John River.

b. Fish River. The Fish River, which discharges to the Saint John River at Fort Kent, is formed by the junction of several small streams in central Aroostook County, Maine, and follows an irregular course through a series of lakes for a distance of about 50 miles to Eagle Lake. From there it flows northerly for about 12 miles to its confluence with the Saint John River at Fort Kent. It has a total drainage area of 892 square miles and a total fall of about 225 feet.

3. FLOOD SITUATION

The commercial district of Fort Kent is located almost entirely on the flood plain of the Saint John River just upstream of the mouth of the Fish River. Substantial damages commence with a Saint John River stage of about 511 feet above mean sea level (msl), at the index gage near the junction of the Fish River, or at a river stage of about 16 feet above average flow conditions. The river has exceeded elevation 511 feet msl 11 times in the past 48 years and the record stage of 515.8 feet msl was experienced this past spring on 1 May 1974. In addition to the frequency of damaging floods the community experiences a flood threat every spring during the snowmelt period.

Historically, flooding at Fort Kent has only occurred during the spring months as a result of snowmelt alone, or in combination with intense rainfall. The area has never experienced a major flood from intense rainfall during a non-snowmelt season.

4. PREVIOUS STUDIES

A hydrologic analysis of the Fort Kent flood problem was made and reported in: "Supplemental Reconnaissance Report, Saint John and Fish River, Fort Kent, Maine;" dated, 2 January 1964. Subsequent updating of this original study was reported in OCE letter: "Reconnaissance Report, Local Flood Protection, Saint John River, Fort Kent, Maine," dated, 1 June 1972.

Extensive hydrologic analyses of the upper Saint John River basin were also made as part of the "Dickey-Lincoln School" hydropower studies in 1965 through 1967. These studies had not been reported when the project was terminated in November 1967.

5. CLIMATOLOGY

a. General. The climate of the upper Saint John River basin is cold with an average yearly temperature of about 40° Fahrenheit (F). Average yearly precipitation is about 36 inches. Because of its northerly location, the area has escaped the brunt of coastal hurricanes with their accompanying intense rainfall. The area does experience periods of moderate rain and/or snowfall as a result of low pressure systems moving up the east coast and from frontal systems moving from west to east across the country.

b. Temperature. Average monthly temperatures in the basin vary considerably throughout the year. Summers are cool with temperatures

averaging 50° to 60° F with only occasional rises into the 90's. Winters are long and cold with temperatures averaging 10° F to 20° F. Subzero temperatures occur approximately 50 days each year. Average monthly temperatures and extremes recorded at Fort Kent, Maine are listed in table A-1.

c. Precipitation. The average annual precipitation over the upper Saint John River basin is about 36 inches and is distributed quite uniformly throughout the year with slightly greater amounts during the summer months. Periods of moderate rainfall are usually not more than one to two days in duration and storm rainfall amounts generally do not exceed one to two inches. Table A-2 lists average monthly and extremes in precipitation as measured at Fort Kent over a 37 year period.

d. Snowfall. Practically all winter precipitation occurs as snow with the total fall averaging about 95 inches per year. Snow survey data for the upper basin is scant but based on information gathered by hydropower interests the snowpack reaches a maximum in April. The average water equivalent of the spring snowpack is about 8 inches, with maximums as high as 15 inches. Table A-3 lists the mean monthly and annual snowfall at Fort Kent for a 35 year period of record.

e. Runoff. The U.S. Geological Survey operates eleven stream gaging stations in the St. John River basin. One of these stations is located on the St. John River at Fort Kent, just downstream of the confluence of the Fish River. This station has been in operation since October 1926 and makes available a continuous record of river stages and flows at Fort Kent. These records have been used extensively in the hydrologic analysis of the flood situation at Fort Kent.

The mean, maximum and minimum monthly discharges for this station are summarized in Table A-4.

The mean annual runoff in the St. John River basin is 22.1 inches which is approximately 60 percent of the mean annual precipitation. Approximately two-thirds of the mean annual runoff occurs in the months of April, May and June, with the remainder distributed rather uniformly throughout the rest of the year. Table A-5 summarizes the records at four USGS stations in the St. John River basin in the general vicinity of Fort Kent.

TABLE A-1

MONTHLY TEMPERATURE
(Degrees Fahrenheit)

Fort Kent, Maine
35 Years of Record
Elevation 530 feet msl

Month	Mean	Maximum	Minimum
January	12.5	57	-42
February	12.4	53	-41
March	23.6	77	-31
April	37.3	83	-9
May	51.1	91	17
June	61.0	95	29
July	65.9	96	33
August	63.5	97	33
September	55.5	91	19
October	44.7	83	7
November	31.4	73	-14
December	15.7	56	-28
Annual	39.3	97	-42

TABLE A-2

MONTHLY PRECIPITATION
(Inches)

Fort Kent, Maine
37 Years of Record
Elevation 530 feet msl

Month	Average	Maximum	Minimum
January	2.16	4.63	.38
February	2.11	4.09	.88
March	2.37	5.86	.55
April	2.24	4.94	.74
May	2.81	5.87	.81
June	3.51	6.86	.47
July	4.16	10.51	1.42
August	3.90	9.97	.85
September	3.49	7.28	.41
October	3.24	5.77	.48
November	3.18	7.00	.21
December	2.62	5.24	.07
Annual	35.85	49.58	25.49

TABLE A-3

MONTHLY SNOWFALL
(Inches)

Fort Kent, Maine
35 Years of Record
Elevations 530 feet msl

Month	Average*	Maximum**	Minimum**
January	22.0	35.0	10.0
February	21.0	38.5	4.1
March	16.8	31.5	4.0
April	5.2	16.1	2.6
May	.5	8.0	-
June	T	-	-
July	-	-	-
August	-	-	-
September	T	-	-
October	1.5	15.4	-
November	8.7	22.4	T
December	19.1	31.5	6.0
Annual	94.8		

*For Entire Period of Record

**For 1962-1972

TABLE A-4

MONTHLY DISCHARGES

Saint John River below
Fish River at Fort Kent
Maine

Month	Mean (cfs)	Maximum (cfs)	Minimum (cfs)
January	2965	7438	871
February	2045	5208	562
March	2820	23590	669
April	21736	45570	3298
May	35051	68100	14580
June	10740	21800	3616
July	6210	14770	2214
August	4935	19130	910
September	4912	14700	935
October	6029	17610	116
November	8271	22720	1367
December	5351	22900	1232

TABLE A-5

STREAMFLOW RECORDS
ST. JOHN RIVER BASIN, MAINE

Location	Drainage Area (sq. mi.)	Period of Record	Annual Average Runoff (Inches/Year)	Annual Average Runoff (cfs)	Maximum Discharge (cfs)
St. John River at Ninemile Bridge, Maine	1,290	1950-1972	23.03	2,188	34,200 25 Apr 1958
St. John River at Dickey, Maine	2,700	1946-1972	22.66	4,505	75,400 10 May 1969
Allagash River near Allagash, Maine	1,250	1931-1972	20.26	1,865	28,800 17 May 1961
St. John River at Fort Kent, Maine	5,690	1926-1974	22.50	9,426	148,000 1 May 1974

6. HISTORY OF FLOODS

The greatest flood of record at Fort Kent occurred on 1 May 1974 when a peak stage of 515.8 feet msl, corresponding to a flow of 148,000 cfs, was experienced at the site of the USGS gaging station on the Saint John River just below the mouth of the Fish River. The resulting peak flow and stage during this event was augmented by the break-up of a build-up of ice on the St. John River approximately 5 miles upstream from Fort Kent. Actual hydrograph data on this flood is still being compiled by the USGS. The 1 May 1974 event resulted from rapid snow-melt and ice breakup, produced by daily maximum temperatures in the upper basin of around 60 degrees on the 28th, 29th, and 30th of April, with above freezing nightly temperatures accompanied by about 0.5 inch of rain on the 29th and 30th of April.

The second greatest flood of record at Fort Kent occurred on 30 April 1973 when 2.0 inches of rainfall fell over the upper basin in a 48 hour period during the normal snowmelt season. A resulting peak stage and discharge of 514.7 feet msl and 136,000 cfs, respectively, were recorded on the St. John River at the Fort Kent USGS gage. Other notable floods occurred in the springs of 1961, 1969 and 1933 when peak stages of 514.00 feet msl or greater were recorded. Data on floods before the establishment of the gage at Fort Kent in 1926 is meager. Table A-6 lists the ten greatest floods of record at Fort Kent.

The threat of high stages on the Saint John River at Fort Kent due to ice jams occurs annually during the spring breakup. Three notable occasions when ice jams caused stages of 511 feet msl or greater occurred in March 1953, April 1955, and April 1960. The estimated rises in stage due to ice were 4 to 6 feet. It should be noted that these ice jam events did not occur coincident with the peak annual discharge. Generally ice jams can be expected to dislodge and pass downstream prior to the peak discharge and corresponding peak stage. The 1 May 1974 flood of record, as previously described, was an exception when the breakup of an upstream ice jam apparently resulted in a surge producing the peak discharge and stage at Fort Kent.

7. FLOOD FREQUENCIES

A discharge frequency analysis was made for the Saint John River using discharge records published by the USGS for the gage at Fort Kent. Analysis was made using a log Pearson Type III distribution with annual peak discharges for each water year of record, 1 October to 30 September. Computations were made in accordance with procedures described in Water Resources Council Bulletin 15, "A Uniform Technique for Determining

TABLE A-6

RECORD FLOODS
ST. JOHN RIVER AT
FORT KENT, MAINE

Date	Peak Discharge (cfs)	Elevation (ft msl)
1 May 1974	148,000	515.8
30 Apr 1973	136,000	514.7
16 May 1961	131,000	514.2
11 May 1969	129,000	514.0
5 May 1933	121,000	513.2
26 Apr 1958	118,000	512.9
11 May 1939	115,000	513.4
5 May 1942	114,500	512.9
9 May 1947	114,000	512.8
22 Apr 1941	109,000	512.5

TABLE A-7

ST. JOHN RIVER BASIN
DISCHARGE-FREQUENCIES
AT FORT KENT, MAINE

Frequency	Years	Discharge (cfs)
1.00	100	175,000
2.00	50	159,000
5.00	20	138,000
10.00	10	122,000
20.00	5	105,000
50.00	2	79,000

Floodflow Frequencies," dated December 1967, and also in, "Statistical Methods in Hydrology," dated January 1962 and cited in the Corps of Engineers EM 1110-2-1450. The mean log and standard deviation of the annual flows were found to be 4.896 and .148, respectively, for the 48-year period of record. Discharge frequencies, using an adopted skew of zero, are listed in table A-7. A stage-frequency curve representing this analysis is presented on plate A-2. The stage-discharge rating curve for the St. John River at the Fort Kent USGS gage is shown on plate A-3.

8. FLOOD ANALYSIS

In addition to analyzing the frequency of historical floods, the relative flood potential of the St. John River basin at Fort Kent was explored by deriving a unit hydrograph and applying standard project storm rainfall.

a. Unit Hydrograph. A unit hydrograph for the St. John River at Fort Kent was derived by analysis of the April 1973 flood hydrograph. The flood hydrograph data for the St. John River at Fort Kent was obtained from the U.S. Geological Survey and supplemented by intermediate flow data transmitted by the "Earth Resources Technology Satellite" (ERTS).

In April 1973, 1.2 inches of rain occurred on the 22nd and 23rd followed by 2.0 inches on the 27th and 28th. The resulting flow hydrograph at Fort Kent had two distinct peaks on the 24th and 30th with the latter being the second largest flood of record. In deriving the unit graph, the estimated baseflow and runoff from the rainfall on the 22nd and 23rd were subtracted from the total hydrograph and the unit graph was determined for the remaining 1.6 inches of excess rainfall resulting from the 2.0 inches of rainfall on the 27th and 28th. The remaining 1.6 inch excess hydrograph had a peak discharge of 75,000 cfs. HEC program, "Unit Hydrograph and Loss Rate Optimization" was used to derive a 6-hour unit hydrograph. Pertinent unit graph data is presented in table A-8.

TABLE A-8

ST. JOHN RIVER
FORT KENT, MAINE
UNIT HYDROGRAPH PERTINENT DATA

D.A.	5,690 sq. mi.
T_R	6 hrs.
T_P	41 hrs.
Q_P	51,000 cfs.
q_p	9 cfs.
C_T	2.1
$C_p 640$	370

b. Standard project storm rainfall. Standard project storm rainfall for the watershed above Fort Kent was determined from data developed during the Dickey-Lincoln School hydropower studies. The town of Fort Kent is located approximately 30 miles downstream from the Dickey-Lincoln School site, and in 1966 a report entitled: "Probable Maximum Precipitation for the St. John River above Dickey damsite and between Dickey and Lincoln School Damsites, Maine," was prepared by the Hydrometeorological Branch of the Office of Hydrology, U.S. Weather Bureau, Washington, D.C. In this report, probable maximum precipitation for 6-hour periods and drainage areas up to 5,150 square miles were presented for the subject basin. Probable maximum storm rainfalls were also developed for various seasons as a percentage of the all-season maximum.

A spring season standard project storm (SPS) rainfall of 3.95 inches in 24 hours was adopted for the watershed above Fort Kent, equal to 50 percent of the probable maximum precipitation as determined for the St. John River basin. Assuming an infiltration rate of 0.2 inch per 6-hour period, a total SPS excess rainfall of 3.15 inches resulted. Six-hour rainfall, losses and excesses are listed in table A-9.

TABLE A-9

SPRING SEASON STANDARD PROJECT STORM
ST. JOHN RIVER BASIN
FORT KENT, MAINE

Time (hr)	Rainfall	Loss	Excess
0-6	.21	.2	.01
6-12	.86	.2	.66
12-18	2.45	.2	2.25
18-24	.43	.2	.23
Total	3.95"	.8"	3.15"

c. Standard Project Flood. Applying the spring season SPS excess rainfall to the 6-hour unit graph resulted in a flood hydrograph peak of 160,000 cfs. To account for coincident snowmelt, a base flow of 40,000 cfs was added to the developed hydrograph resulting in a snowmelt standard project flood (SPF) at Fort Kent of 200,000 cfs, representing a stage of 520 feet above mean sea level at the USGS Gage.

A comparable standard project flood discharge was also computed by applying the 24 hour SPS rainfall excess to the equation for determination of runoff from snowmelt developed by the Hydrologic Engineering Center and reported in Volume 4, "Hydrograph Analysis," dated October 1973. The resulting snowmelt by this method was 1.0 inches for a total runoff of 4.2 inches. Applying this total runoff to the unit graph resulted in a standard project flood peak of 200,000 cfs or the same discharge as previously developed by adding an estimated snowmelt baseflow to the rainfall excess hydrograph.

The developed snowmelt SPF would be 35 percent greater in discharge and 4.2 feet higher than the record 1974 flood, at the site of the Fort Kent gaging station.

9. DESIGN FLOOD

Based on studies by the Planning Division of costs versus benefits for various levels of design, the 100 year frequency flood discharge of 175,000 cfs, plus 2 feet of freeboard, was adopted as the design flood for the Fort Kent Protective Works. The design flood discharge is 18 percent greater then the flood of record discharge of 148,000 cfs, and about 12 percent less then the developed Standard Project Flood. A river stage to the top of the freeboard zone would represent a Saint John River discharge of 195,000 cfs.

10. HYDRAULIC DESIGN

a. Hydraulic Gradient - The hydraulic gradient of the Saint John River through Fort Kent is approximately .0003. This slope was determined from cross-sectional surveys of the river, river profiles, and analysis of stage-discharge relationships at the USGS gage. The reach length between the USGS gage and the International bridge at Fort Kent is about 3,500 feet, resulting in about a 1 foot drop in the river profile.

b. Height of Protection - The protective dike will be built to a top elevation of 521.5 feet msl at the upstream end of the project which is located about 925 feet west of the International Bridge. It will slope uniformly to elevation 521.0 ft. msl at the bridge, then follow a slope of .0004 for approximately 2,300 feet, tying into high ground at elevation 520.0 feet msl, approximately 350 feet upstream from the mouth of the Fish River. The bituminous concrete and gravel road running along the left bank of the Fish River will be raised to elevation 518 feet msl from the Main Street bridge to the "Block House," a historic

site. The entire project is designed to protect the 100-year flood level plus freeboard, except along the Fish River where the freeboard zone will be accomplished by sandbagging along the raised roadway.

c. Freeboard - The proposed line of protection will provide two feet of freeboard above the 100-year flood level along the Saint John River. The top of the freeboard zone represents a total Saint John discharge of 195,000 cfs.

Freeboard along the Fish River, as described in the previous paragraph, will be provided by sandbagging in accordance with criteria set forth in Engineer Bulletin 54-14.

d. Velocities - With a project design flood in the Saint John River the average channel velocities would be approximately 6 feet per second. This velocity is based on an average slope of .0003 and a Mannings "n" value of .03.

e. Riprap - The river side of the dike will be protected with a layer of stone riprap. The design of riprap protection was based on the "tractive force" theory set forth in EM 1110-2-1601, entitled, "Hydraulic Design of Flood Control Channels". A D50 minimum (equivalent diameter of the 50 percent by weight finer stone) of 0.5 feet was adopted for the design of riprap of the 1 vertical to 2-1/2 horizontal side slopes.

11. INTERIOR DRAINAGE

a. General - Interior drainage from approximately 173 acres will be intercepted by the construction of the local protection project. The interior area consists of: (1) a 110 acre high level watershed which will discharge by gravity via pressure conduit during periods of flood in the Saint John and, (2) a 63 acre low level watershed which will drain by gravity during normal periods, but will require pumping during high river stages. The interior area is delineated on plate A-4 which is an aerial photograph taken 24 hours prior to the 1973 peak discharge.

b. Rainfall and Runoff Probabilities - Rainfall data for the Fort Kent area were taken from "Rainfall Frequency Atlas of the United States, Technical Paper # 40, U.S. Weather Bureau, May 1961." Interior runoff for both areas was computed using the rational formula and adopted runoff coefficients. Historically, flooding on the Saint John River has occurred only during the spring months of April and May. And, though peak interior runoff rates were computed using the all season rainfall probabilities, it is noted that according to Technical Paper # 40, the

probability of high intensity rainfall during April and May is about 5 to 10 times less than during the summer season months of July and August.

c. High Level Area - On the southern side of Fort Kent there are many acres of steep agricultural land sloping towards the town. Runoff from this area flows northerly, through culverts located along the Bangor and Aroostook Railroad to swamps and low lying areas east and west of Hall Road. Drainage entering east of Hall Road flows east towards the Fish River and outlets to the Fish River outside the proposed project. Drainage entering west of Hall Road flows west and outlets to the Saint John River. Runoff from 110 acres presently outlets into the Saint John River west of Hall Road via three existing culverts. The three existing culverts will be replaced by one 48" diameter pressure conduit outletting to the Saint John River approximately 450 feet upstream of the International Bridge. A headwall to elevation 522 feet msl will be required to pass the 100-year discharge against the design river stage.

Discharge frequencies for the 110 acre high level area, listed in Table A-10, were computed by the rational formula using a time of concentration of 1 hour and a "c" of 0.3.

TABLE A-10

DISCHARGE - FREQUENCIES
110 ACRE HIGH LEVEL AREA

Frequency (years)	Discharge (cfs)
2	26
5	33
10	40
50	53
100	60

d. Low Level Area - The low level area is comprised of the downtown business district and surrounding residential areas for a total of 62.3 acres. Table A-11 summarizes pertinent data on the low level watershed and the area is shown on plate A-4.

TABLE A-11

LOW LEVEL AREA
PERTINENT DATA

	Commerical	Residential
Total Area	29.0 Acres	33.3 Acres
Average slope	1 Percent	2 Percent
Time of Concentration	30 Minutes	30 Minutes
Average "c" value	.4	.3

Computed discharge frequencies for the low level area, using the rational formula and the above characteristics, are listed in Table A-12

TABLE A-12

LOW LEVEL AREA
DISCHARGE - FREQUENCIES
FORT KENT, MAINE

Frequency (years)	I (IPH)	Q (cfs)
1	1.0	22
2	1.2	26
5	1.6	35
10	2.0	44
25	2.3	50
50	2.5	55
100	2.9	63

e.. Ponding - There are no natural ponding areas within the line of protection where runoff can be temporarily stored without causing

flood damage. Considerable cellar flooding results in the commercial district with any ground surface innundation. In the event ponding does take place it will first occur between Main Street and the proposed dike. Secondly, it will occur in two areas south of Main Street. The larger area is just east of the International Brige, between Main and Elm Streets and the other is located in the block bordered by Main Street, Hall Road and Elm Street. Elevation-area-capacity curves for the low level ponding is shown on plate A-5. Surface ponding commences at about elevation 511 feet msl, however, cellar flooding damages at this stage amount to over $100,000. Therefore, ponding stages A, B and C as defined in EM 1110-2-1410 were selected at approximately 509, 511 and 513 feet msl, respectively.

f. Pumping Station - A pumping station will be provided with capacity to pump a runoff rate of 30 cfs from the low level area to the Saint John River under design flood conditions in the river. The station will be located adjacent to the dike off Main Street near the intersection of Main Street and Meadow Lane.

Annual peak stages on the Saint John River have historically occurred in the spring months of April and May. As previously mentioned, probability of high intensity rainfall over the interior area is less in the spring than in the summer or fall. Therefore, annual benefits versus costs of pumping were analyzed assuming that the probability of intense rainfall coincident with a high river stage was approximately 40 times less than the frequency of the associated all season storm. For example, the 2-year frequency all season storm coincident with a high river would be an 80-year event. Based on this assumption, the pumping rate was found to be near optimum at 30 cfs with an overall benefit to cost ratio greater than one. The adopted 30 cfs pumping capacity is equivalent to a runoff rate from the low level area of about 0.5 inch per hour and according to flood damage estimates, average annual benefits from pumping will be in the realm of $40,000.

Pumping will be initiated at river stage of about 508 feet msl and the frequency of pumping will be almost annually.

g. Gravity Drains - All gravity drains through the line of protection will be designed to pass the 100-year frequency discharge against a normal river stage. All such outfalls will be equipped with emergency closures.

PROPOSED LOCAL PROTECTION PROJECT

Q U E B E C

N E W

B R U N S W I C K

M A I N E

AROOSTOOK CO.

SOMERSET CO.

PISCATAQUIS CO.

PENOBSCOT CO.

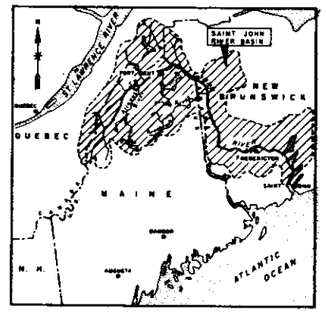
CANADA U.S.A.

BAY OF FUNDY

SAINT JOHN RIVER BASIN

BASIN MAP

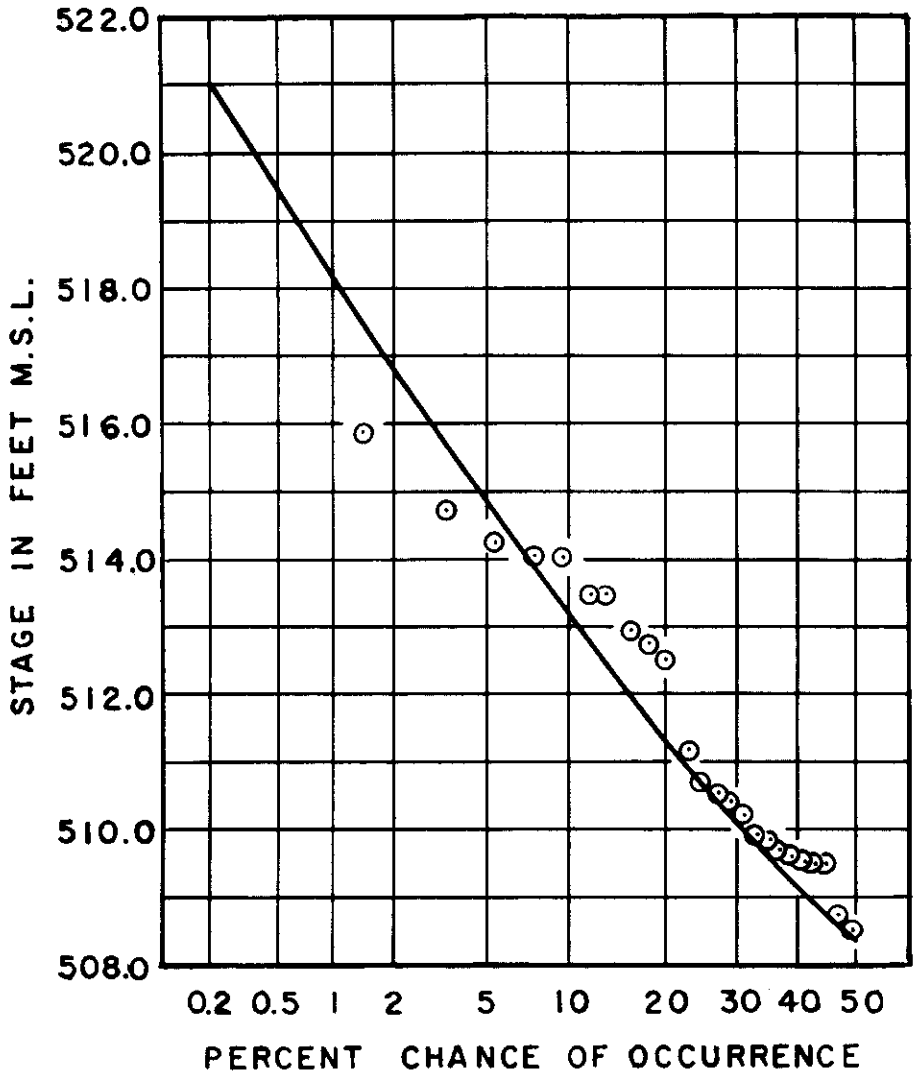
SCALE IN MILES



VICINITY MAP

SCALE IN MILES

PLATE A-1



⊙ RECORDED EVENTS

DRAINAGE AREA = 5690 SQ. MI.

WATER RESOURCES DEVELOPMENT PROJECT

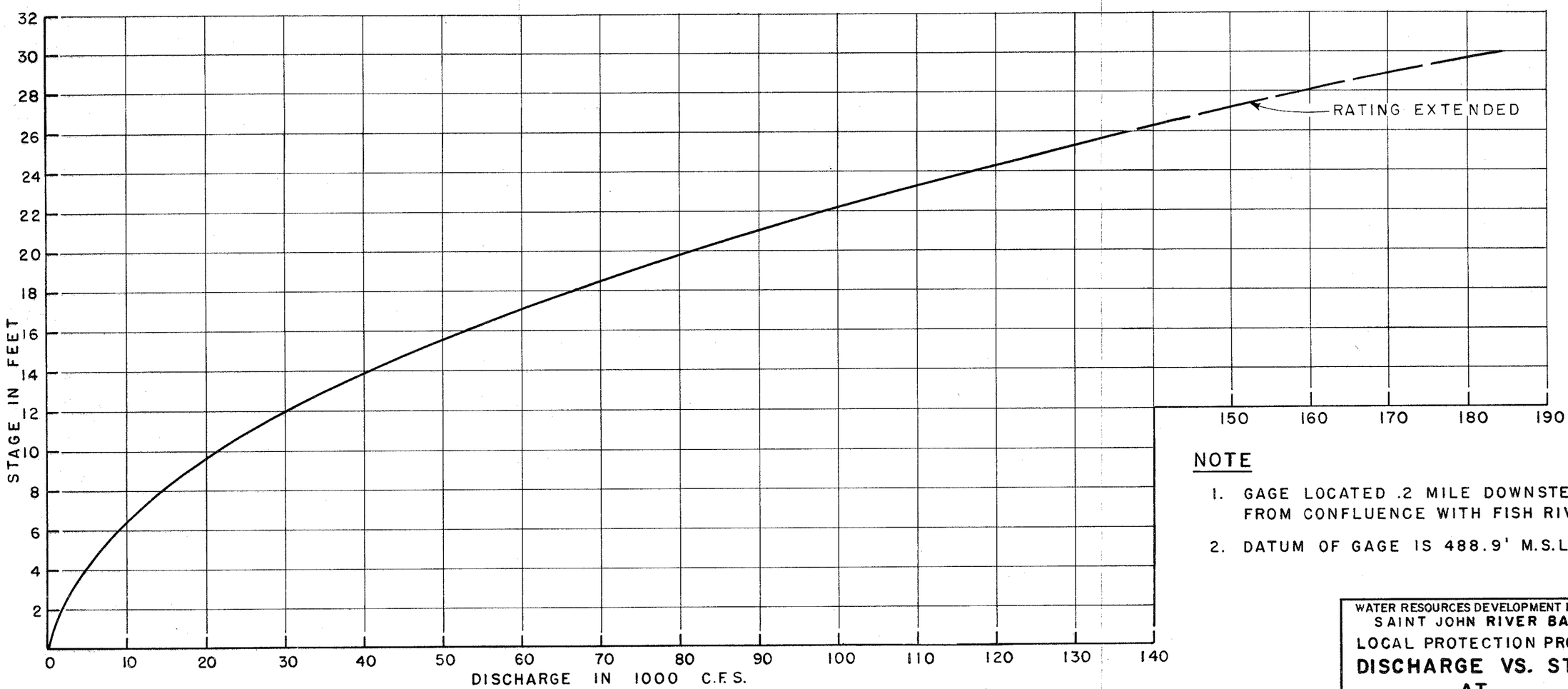
STAGE VS FREQUENCY

AT

U.S.G.S. GAGE

FORT KENT MAINE

PLATE A-2



NOTE

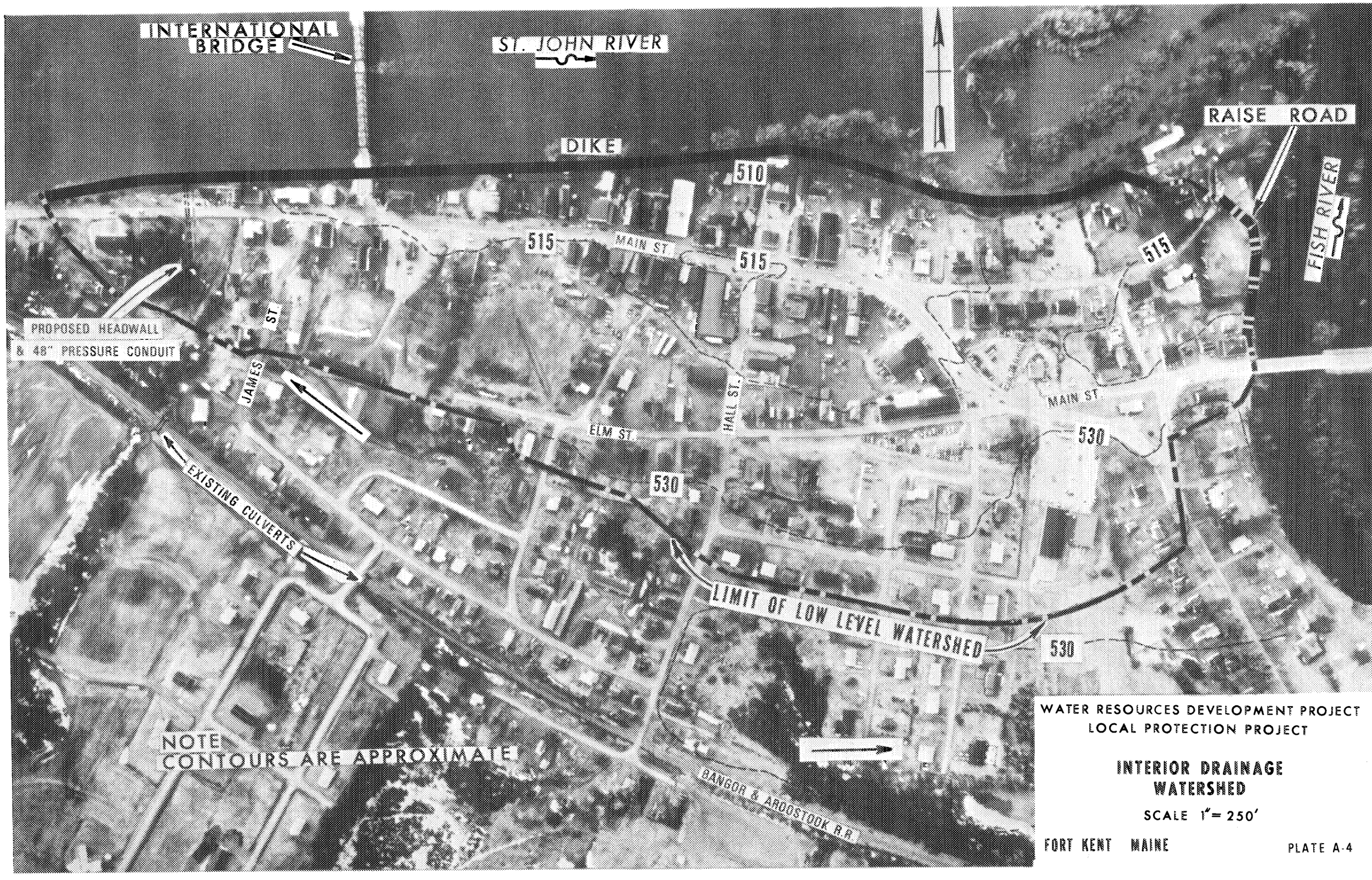
1. GAGE LOCATED .2 MILE DOWNSTEAM FROM CONFLUENCE WITH FISH RIVER.
2. DATUM OF GAGE IS 488.9' M.S.L.

WATER RESOURCES DEVELOPMENT PROJECT
SAINT JOHN RIVER BASIN
LOCAL PROTECTION PROJECT

DISCHARGE VS. STAGE AT U.S.G.S. GAGE

FORT KENT MAINE

PLATE A-3



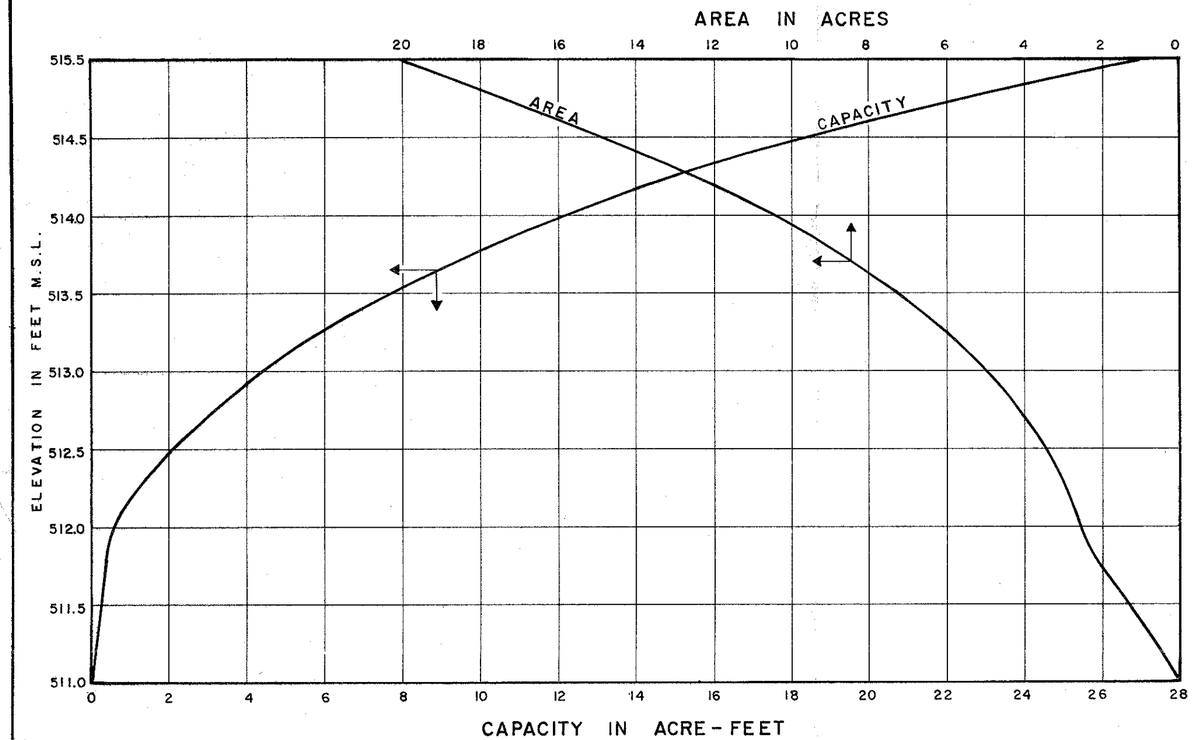
WATER RESOURCES DEVELOPMENT PROJECT
LOCAL PROTECTION PROJECT

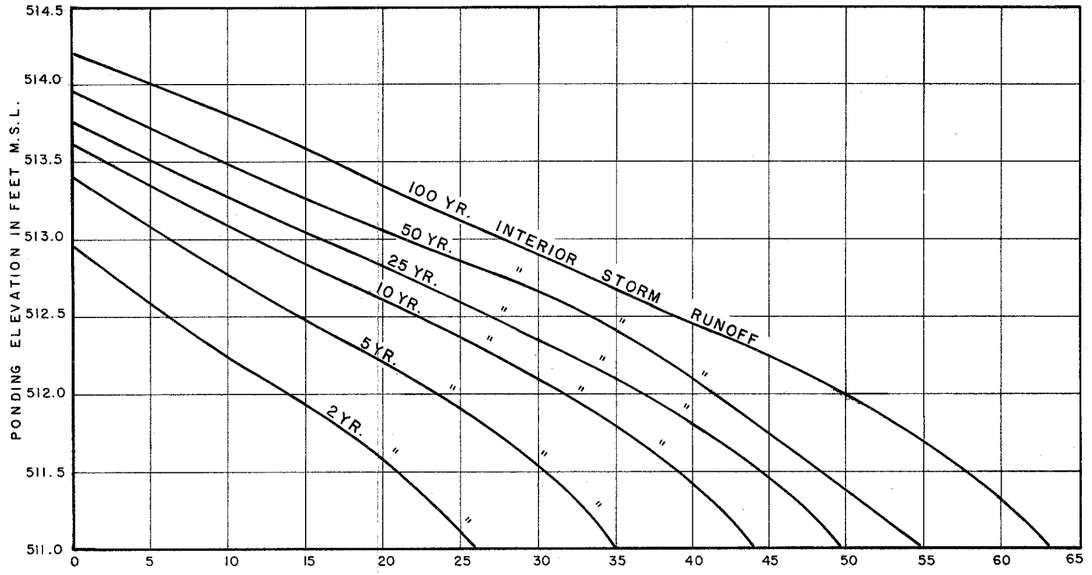
INTERIOR DRAINAGE WATERSHED

SCALE 1"= 250'

FORT KENT MAINE

PLATE A-4





WATER RESOURCES DEVELOPMENT PROJECT
LOCAL PROTECTION PROJECT
INTERIOR DRAINAGE
HYDROLOGY
FORT KENT MAINE

PLATE A-5

SECTION B

ECONOMICS AND RESOURCES ANALYSIS

ST. JOHN RIVER FLOOD CONTROL

FORT KENT, MAINE

LOCAL PROTECTION PROJECT

SECTION B

ECONOMICS AND RESOURCES ANALYSIS

TABLE OF CONTENTS

SECTION B

ECONOMICS AND RESOURCES ANALYSIS

Fort Kent has had recent repeated flood damages. This report portrays existing conditions in a profile describing the relevant economic characteristics of the study area. The economic profile analyzes human resources, economic activity and structure, future development, and flood damages.

INTRODUCTION

Fort Kent is the population and business center of the state designated Fort Kent Labor Market Area (FKLMA). Lying in the north-central sector of Maine in Aroostook County and bordering the Canadian province of New Brunswick, the Labor Market Area comprises ten towns. Persistent unemployment provided the basis for establishing the Fort Kent Redevelopment Area in December 1967 under Title IV of the Public Works and Economic Development Act of 1965. The two neighboring Labor Market Areas were declared eligible for this designation in 1970 and 1971. The Fort Kent Redevelopment Area is approximately 600 square miles. The total population in 1970 was 10,836; five communities accounted for 80 percent of the Area population. Fort Kent is the largest town in the Redevelopment Area with 4,575 people in 1970 and the sixth largest community in the Northern Maine Regional Planning Area. Aroostook County accounted for 98 percent of the planning area which is 1/5 of the State's entire area. The County is recognized throughout the East as "The Potato Empire".

According to the 1967 State Land Use Summary, over 80 percent of total acreage is in forests and 10 percent in cropland. The economic health of the Aroostook region fluctuates in direct proportion to the potato market. Farming and lumbering operations in particular have provided the economic base for the Fort Kent Labor Market Area. Other major sources of employment are a clothing manufacturer with 100 employees and the University of Maine in Fort Kent. The region is the site of an EDA-funded Regional Airport, completed in 1973. Located in Frenchville, it is the second jet airport in Aroostook County and is expected to give a needed boost to the economic development of this labor market and the neighboring Madawaska-Van Buren Area. The economic potential of recreation in the Allagash Wilderness Waterway is boundless and virtually untapped.

Within easy commuting distance, the Madawaska-Van Buren Labor Market Area (MVBLMA) also provides employment for the residents of Fort Kent. The largest single employer, with 1,100 people, is a manufacturer of specialty paper products. Mechanization of the potato industry has had a harsh effect on this region. From 1960 to 1969, there was a 44 percent loss in agricultural employment. In 1969, it accounted for only 265 people.

HUMAN RESOURCES

Population Characteristics

Table B-1 shows that population losses were particularly acute during the past twenty years in the Fort Kent and Madawaska-Van Buren Labor Market Areas, and Aroostook County. The basic cause is felt to be the sharp drop in agricultural jobs experienced in the past two decades. Having experienced a higher rate of net out migration than that of the State during the 1960's, Aroostook County lost over 11 percent of its population. Migration within Maine tends toward the six southern-most counties which have 54 percent of the state's population living on 12 percent of the state's total land area. Since 1940 the population in the state of Maine has increased at a diminishing rate and in Aroostook County the population has been fairly constant. In both of the labor market areas, population losses have been exceedingly heavy in the past two decades. In the Fort Kent Labor Market Area population has declined by nearly 30 percent, and in the Madawaska-Van Buren Labor Market Area it has diminished by 10 percent.

From 1950 to 1970, the population in the town of Fort Kent sharply decreased by 14.4 percent while the urban sector within the community declined only 4 percent. The town population has continuously declined in each of the past two decades. However, the urban sector leaned the other way and showed a 3.2 percent increase during the 1960's. This is indicative of the increasing trend of population movements away from rural areas. Also the percentage share of total rural population in both labor market areas and Aroostook County has been declining. The three largest communities in the county have a population ranging from 10,000 to 11,000. Presque Isle, Caribou and Limestone each respectively experienced a decline of 11, 20, and 21 percent respectively in the 1960's.

Population losses struck hardest at the 0-14 age groups and the 25-44 age groups. Even with these losses, there is still a much higher percentage of young people in Northern Maine areas than that which exists in Maine or the nation. Furthermore, with the increasing share of elderly population, it is easy to recognize the serious problems facing the entire region. The

TABLE B-1 POPULATION CHARACTERISTICS

Population	Area	1950 Number	1950 Pct	1960 Number	1960 Pct	Pct Change 1950-60	1970 Number	1970 Pct	Pct Change 1960-70
TOTAL	FKLMA	14, 851	100%	12, 245	100%	- 17. 6 %	10, 836	100%	- 11. 5%
	MVBLMA	11, 910	100	11, 771	100	- 1. 2	10, 865	100	- 7. 7
	Aroostook	96, 039	100	106, 064	100	+ 10. 4	95, 078	100	+ 11. 3
	Maine	913, 774	100	969, 265	100	+ 6. 1	993, 663	100	+ 2. 5
	USA (000)	151, 326	100	179, 323	100	+ 18. 5	203, 166	100	+13. 3
0-14 AGE GROUP	FKLMA	5, 406	36. 4	5, 126	42. 0	- 5. 2	3, 738	34. 5	-27. 1
	MVBLMA	4, 464	37. 5	4, 943	42. 0	+10. 7	3, 738	35. 7	-21. 6
	Aroostook	33, 837	35. 2	39, 620	37. 4	+17. 1	30, 073	33. 2	-22. 6
	Maine	253, 454	27. 7	300, 978	31. 0	+18. 8	285, 981	28. 8	- 5. 0
	USA (000)	40, 072	26. 9	55, 786	31. 0	+37. 2	57, 910	28. 5	+ 3. 8
15-64 AGE GROUP	FKLMA	8, 376	56. 4	6, 074	50. 0	-27. 5	6, 125	56. 5	+0. 8
	MVBLMA	6, 893	57. 9	5, 598	52. 4	-18. 8	6, 131	56. 4	+9. 5
	Aroostook	56, 030	59. 3	59, 336	55. 9	+ 5. 9	55, 570	58. 3	-6. 3
	Maine	566, 758	62. 1	561, 743	58. 0	- 0. 9	593, 090	59. 6	+5. 6
	USA (000)	98, 360	65. 0	106, 978	60. 0	+ 8. 8	125, 206	61. 6	+17. 0
65 and Over AGE GROUP	FKLMA	1, 069	7. 2	948	8. 0	-11. 3	973	9. 0	+2. 6
	MVBLMA	553	4. 6	655	5. 6	+18. 4	858	7. 9	+31. 0
	Aroostook	6, 172	6. 4	7, 108	6. 7	+15. 2	7, 835	8. 5	+10. 2
	Maine	93, 562	10. 2	106, 544	11. 0	+13. 9	114, 592	11. 6	+7. 6
	USA (000)	12, 294	8. 1	16, 559	9. 0	+34. 7	20, 050	9. 9	+21. 1
Rural Population	FKLMA	9, 510	64. 0	9, 458	77. 2	-0. 5	7, 960	73. 5	-15. 8
	MVBLMA	5, 203	43. 7	4, 147	35. 2	-20. 3	2, 984	27. 5	-28. 0
	Aroostook	63, 327	65. 9	65, 404	61. 7	+3. 3	46, 809	50. 6	+3. 3
	Maine	441, 474	48. 3	472, 151	48. 7	+6. 9	487, 891	49. 2	+3. 3
	USA (000)	54, 479	36. 0	54, 041	30. 1	-0. 8	53, 885	26. 5	-0, 3

Source: Overall Economic Development Program for Northern Maine May 1974
Maine Employment Security Comn ission

area has an abnormally high percentage of its population in the dependency years with a less than adequate share of working age people. Forty-four percent of the current populace is in the dependency group in both Fort Kent and Madawaska-Van Buren Labor Market Areas. On the other hand, 59.6 and 61.6 percent of the populace are in the working age groups for Maine and the United States.

Civilian Labor Force

Despite the high outmigration rate of population in Aroostook County, Table B-II shows that there is still an unusually high level of unemployment, and much hidden unemployment. Everywhere one looks in Aroostook, there are signs of healthy growth- new stores, expanding industries, record sales. There is growth, but more and faster growth is necessary to reduce unemployment and outmigration. The Labor Force Participation Rates have grown during the past decade but, except for Madawaska-Van Buren area, they are still way below the State and Federal levels. Many people in the Fort Kent Area, who normally would be expected to enter the labor force, will not under adverse economic conditions. Therefore the potential unemployment rate is sharply higher than that which now exists.

Since 1960, the size of the labor force in the Fort Kent area increased and unemployemnt levels dropped slightly. In the Madawaska area, unemployment levels and the size of the labor force were noticeably higher. The unemployment rate declined in the Fort Kent Area and increased in the Madawaska Area. Both rates were higher than that of Aroostook County which in turn was more than the state and national averages. During 1971-1973 the average annual unemployment rates in the Fort Kent Area declined and in Madawaska-Van Buren they increased. However, the labor force in both labor market areas declined in this period; a harsh way to cut high unemployment rates. Thus both areas having both chronic unemployment and underemployment, were eligible for federal assistance under the Economic Development Act of 1965.

Some of the interesting characteristics of the unemployed in Fort Kent Area are (1) Male unemployment accounts for 75 percent of the total; yet it is evenly distributed in the four other labor market areas of Aroostook and (2) Unusually heavy concentations are found among the unskilled workers and the older workers. On the other hand, in the Madawaska-Van Buren Area many skilled people are willing to work; but they have no place to practice those skills at the local level. In the former area, 19 percent of the total work force living in the area had to commute outside the area for jobs.

TABLE B-II CIVILIAN LABOR FORCE

Area	Year	Population (14 + over)			Labor force			Participation %			Unemployed total			Unemployed Rate		
		Total	Male	Female	To.	Ma.	Fe.	To.	Ma.	Fe.	To.	Ma.	Fe.	To.	Ma.	Fe.
FK LMA	1960	7140	3563	3577	2469	NA	NA	34.6	NA	NA	367	NA	NA	14.9	NA	NA
	1970	7146	3551	3595	2780	1893	887	38.9	53.3	24.7	327	198	129	11.8	10.5	14.5
MVB LMA	1960	7091	3495	3596	3569	NA	NA	50.3	NA	NA	288	NA	NA	8.1	NA	NA
	1970	7281	3529	3752	4300	2799	1501	59.1	79.3	40.0	400	206	194	9.3	7.4	12.9
AROOSTOOK	1960	68323	35661	32662	29728	21257	8471	43.5	59.6	25.9	1888	1457	431	6.4	6.9	5.1
	1970	64027	31456	32562	32450	20865	11585	50.7	66.3	35.6	2847	1489	1358	8.8	7.1	11.7
MAINE	1960	683324	333995	349329	353398	234859	118539	51.7	70.3	33.9	22814	14750	8064	6.5	6.3	6.8
	1970	725983	349929	379054	394600	241890	152710	54.4	69.1	40.3	23000	12275	10725	5.8	5.1	7.0
USA (000)	1960	126277	61315	64961	70612	47028	23587	55.9	76.7	36.3	3931	2541	1390	5.6	5.4	5.9
	1970	149352	71467	77885	86000	54000	32000	57.6	75.6	41.1	4088	2235	1853	4.9	4.4	5.9

SOURCE: Overall Economic Development Program
for Northern Maine. May 1974
Maine Employment Security Commission
NA - not available

Personal Family Income

Table B-III includes Family Income data for three municipalities as well as comparative data for county, state, and nation. Local income levels today are still far below state and national averages. In Aroostook County 17 percent of families subsist on less than $3,000 annually. The heaviest percentage of families in this category, accounting for 17 percent of the total, lie in the Fort Kent Area. In the communities of Fort Kent and Van Buren the number of families below the subsistence level is well above state and national averages. Their incomes are also lower than the state and national median levels. This is not unexpected and reinforces the previous data on low labor force participation rates and exceedingly high unemployment rates.

In general, there is a good correlation between educational attainment, income earning capcity, and employment opprotunities. In 1970, the percentage of person 25 years of age and older who had four years or less of formal schooling exceeded the national average in all of Northern Maine'sfive labor market areas. For the town of Fort Kent, the median school years completed was four years below the state and national averages. The Fort Kent and Madawaska-Van Buren Labor Market Areas had a lower than average number of people who attained 13 or more years of education. However a major problem for Northern Maine is the lack of jobs rather than a lack of educated workers.

ECONOMIC STRUCTURE AND ACTIVITY

Data on employment by economic sector is sparce due to the lack of meaningful past records on areas which are less than county size. Nevertheless some important trends can be revealed from the data in Table B-IV and the results of Northern Maine Regional Planning Commission (NMRPC) surveys. In Aroostook County, 4,200 jobs generally associated with a male labor force have been lost in Agriculture, Construction, and Utilities. This was partially offset by 1,800 additional jobs in manufacturing and 700 jobs in trade industries. However most of the new jobs depends on a female labor force. As mentioned earlier, this is a particularly acute problem for the Fort Kent Area. The largest gain in the manufacturing sector in Northern Maine occurred in the food industry, most of which was linked to the potato processing industry! This supports the continuing heavy reliance on a single industry in this region.

TABLE B-III PERSONAL FAMILY INCOME

FAMILY INCOME	FORT KENT AREA FORT KENT				MADAWASKA - VAN BUREN AREA MADAWASKA				VAN BUREN			
	1959		1969		1959		1969		1959		1969	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Families	937		1000		1224		1300		995		851	
Poverty Level	275	29.4	188	18.8	192	15.7	124	9.5	331	33.3	181	21.3
$10,000 + over	62	6.6	222	22.2	121	9.9	471	36.2	57	5.7	149	17.5
MEDIAN	4057		6780		5481		8600		3911		6505	

	AROOSTOOK				MAINE				USA (000)			
	1959		1969		1959		1969		1959		1969	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Families	23673		22308		240245		248154		45128		51168	
Poverty Level	1331	31.0	3636	16.3	54812	22.8	25622	10.3	8320	19.1	5462	10.7
$10,000 + over	1304	5.5	5498	24.6	18412	7.6	87072	35.1	6498	14.4	24165	47.2
MEDIAN	4093		6929		4873		8205		5600		9590	

TABLE B-IV
EMPLOYMENT BY ECONOMIC SECTOR
(1960 & 1970)

INDUSTRY	REDEVELOPMENT AREA (NUMBER OF EMPLOYEES)			
	Aroostook County		FK RA	M-VB RA
	1960	1970	1970	1970
Employment	32,100	31,000	2,460	4,020
Agriculture	8,700	5,200	400	430
Non agricultural	3,600	3,700	380	460
Manufacturing	4,800	6,600	430	1,390
Leather	100	200	--	--
Paper	1,000	1,100	--	--
Lumber	2,400	2,000	290	210
Food	1,000	2,600	30	20
Nonelectrical Machinery	0	100	--	--
Apparel	100	100	--	--
Plastics & Rubber	0	400	--	--
Printing	100	100	--	--
Fabricated Metals	0	a	--	--
Other MFR	100	a	110	1,160
Construction	1,100	800	60	420
Utilities	1,800	1,400	40	50
Trade	4,500	5,200	500	470
Finance	700	700	40	50

(TABLE B-IV Cont.)

	Aroostook County		FK RA	M-VB RA
	1960	1970	1970	1970
Government	4,800	5,100	460	550
Other	2,100	2,300	150	210

a- Less than 50
-- Not available; 1960 data not available for redevelopment areas
SOURCE: Maine Employment Security Commission

In the Fort Kent Area, jobs are evenly distributed between Agriculture, Manufacturing, Trade and Government. The bulk of manufacturing jobs is related to the lumbering industry. Most of the 110 jobs listed under "other manufacturing" can be accounted for by an apparel manufacturer in Fort Kent. The Madawaska-Van Buren Area is more heavily concentrated in manufacturing jobs than the other labor market areas in Northern Maine.

The important linkage and multiplier effects have been restricted on account of the small share of employment in manufacturing. Leading national growth industries, such as electronics, non-electrical machinery, and instruments, are expected to be predominant in the nation during the 1970's. However, these are now almost wholly missing in Aroostook. In Northern Maine, the paper, lumber, and food industries account for 86 percent of total manufacturing. Yet manufacturing in Aroostook and the Fort Kent Area provide only 21 percent and 17 percent respectively of the total employment while in the state of Maine manufacturing provides almost 30 percent of the total job opportunities.

In Aroostook County and the Fort Kent Area, agriculture accounts for 16 percent of the total employment. For all practical purposes, the potato crop is the total extent of farming. In the past 14 years, the combination of poor prices, expanding production costs, and dependence on a single crop economy has taken its toll. With limited manufacturing emphasizing nondurable goods and a single crop economy, Northern Maine does not have a mature economy.

There are many obstacles to overcome in Northern Maine and the Fort Kent Area to assure the continuation of the healthy job opportunities which have gradually developed during the 1960's. The inability to obtain adequate financing at favorable interest rates from the local financial intermediaries is the most frequently mentioned deterrent. Other prominent obstacles are geographic location, highway conditions, lack of guaranteed committments of raw materials, and minimal low cost power availability.

A good number of these obstacles must be overcome in order to encourage future employment growth. Between the skilled labor pool in Madawaska and the unskilled group in the Fort Kent Area, heterogenous labor inputs are available. Better job opportunities will encourage population growth and service facilities essential to an expanding economy. For example, this will stimulate greater in-

bound rail freight traffic resulting in better load balance for freight carriers. Lower transportation costs will result from rail service which can carry capacity loads in both directions. A major block to lower rates has been the lack of balanced trade. Import traffic has not increased at the same pace as export traffic. Industrial growth hasn't yet provided enough local jobs to stimulate the population growth necessary to attract increased local demand for imported goods. Thus many carriers must return to the region with empty cars.

FUTURE DEVELOPMENT

A diminishing population, coupled with severe unemployment rates and median income well below the state and federal averages in the Fort Kent Area, can only be reversed with new job opportunities. In order to obtain a good rate of economic growth, the manufacturing share of total employmet must increase. This must be concentrated in such nationally growing industries as electrical equipment supplies, chemicals, non-electrical machinery, and rubber and plastics. Further effort will have to be put into import-substitute products and industries currently exporting outside the region. Consequently, expansion in these areas will generate substantial multiplier effects through linkages to other industries and add purchasing power created by workers.

Historically, the transformation of a young economy into a mature one follows a three-stage process. First, agriculture is the sole basis for economic survival. Next industrialization takes place. Today in the Fort Kent Area, both economic activities account for 17 percent each of the total employment. In the state of Maine manufacturing accounts for 28 percent of employment and agriculture provides 4 percent of the jobs. Balanced growth in the Fort Kent Labor Market Area has not been beneficial. Future development must stress manufacturing employment.

Increasing growth in future flood loss potential is highly probable. Each flood has been worse than the last as more intensive timber-cutting operations at the head-waters of the St. John River and its tributary streams reduce the watershed's capacity to absorb the spring runoff. Secondly, rural population has been declining and population centers are becoming more concentrated. Heavier damages will occur with an increase in land density.

The installation of flood control dikes, which will offer protection from the 100 year flood, can also provide a beneficial psychological impact on the community and labor market area. Favorable economies of scale should then develop. Firms will move into the Fort Kent Area in order to use the available heterogeneous labor supply. Unemployment rates will fall here and in the Madawaska-Van Buren Labor Market Area. The familiar economic multiplier effect will have a favorable impact as additional investment in plant and equipment takes place. Therefore the installation of the proposed dike can be the much needed catalyst for the economic advancement of this poor region.

CHARACTER OF FLOOD AREA, LOSSES, AND FLOOD CONTROL BENEFITS.

The low-lying town of Fort Kent is situated at the junction of the St. John and Fish Rivers. A local protection plan has been proposed along the south bank of the St. John River from upstream of the International Bridge to the Fish River-St. John River confluence. The flooded area begins above the International Bridge where the water overflows the bank of the river. The water deluges 60 commercial establishments, 35 homes, and several public buildings in the business district on US Route #1, (Main Street) and flows down to the junction of Route 161. The flat inland area off Main Street can resemble an enormous artificial pond during flood periods.

During serious flooding, all property along both sides of Route 1 in the Central Business District is inundated with rising water. The Central Business District in this flooded area is the activity center for the Fort Kent Labor Market Area. Accounting for nearly 50 percent of the total area population, Fort Kent is the commercial and railroad center of this labor market area.

With repetitive annual flooding, individual welfare declines, optimum resource allocation is disturbed, business costs increase, and inefficiency and waste are inevitable results. Materials can't be stored in basements and in most cases must be removed from the first floor when water rises. Because of the constant threat from severe water damage, much potential business storage space is lost and inventory accumulation is minimized. When necessaties are often unavailable,

consumers are inconvenienced. Vacancies occur as tenants depart from commercial and residential property. Maintenance of property is neglected. Thus business profits are lowered. Without a normal return on their investment, many of the 60 commercial establishments in the flood-prone area will find other locations in new communities.

In this frigid climate, heating units are located in the basement. When water floods the property, heat loss occurs causing frozen pipes and great distress. Increasing property damage lowers values and increases depreciation. Thus the town's income base, highly dependant on an eroding property tax, is diminishing.

The town of Fort Kent has been flooded five times in the past six years. Annual spring floods are expected to be a virtual certainty unless something is done to avert them. Each flood has been worse than the last, as more intensive timber-cutting operations at the headwaters of the St. John and its tributary stream reduce the watershed's capacity to absorb the spring runoff. As Table I shows, rural population has been declining and population centers are becoming more concentrated. With an increase in the density ratio, future flood damages will cause a heavier toll. From 1968 to 1974, the consistency of peak discharges has no previous match. In fact record floods have been set in 1974, 1973, 1969, 1970. The first three above-mentioned floods are listed one, two, and four respectively among the twelve greatest flows of record.

In April and May 1974, the most serious flooding occured. A six-mile long ice jam in the St. John River let go, spilling tons of water, mud, and debris into the town. Areas of town, never before flooded, were threatened by the rising waters. Roads around the town were cut off to traffic with this inundation. More than 350 persons were evacuated at the height of the flood. A quarter-mile section of the community's Central Business District on Main Street was abandoned, and the owners of some stores reported three feet of water inside the buildings. Some of the damage, especially to building exteriors, was caused by large chunks of ice that hit the buildings as the water swept by. Most damage, however, was done by water. Both the rapidity and severity of this new record flood was quite pronounced. The rampaging waters came cascading over lines of sandbags, covering Main Street four feet deep in 30 minutes. Usually the river rises about an inch per hour and residents believed they had plenty of time to evacuate.

In the 1974 flood, economic disruption and dislocation was exceedingly severe. J. J. Newbury, a major chain store, permanently closed its doors. Their nearest store is now located in Madawaska. Sears is threatning to close its catalog store. The largest building supply store in Fort Kent incurred property and inventory damages of 50 percent. Since the flooding occured during the annual spring clean-up, sales were permanently lost. Small Business Administration Loans must be renegotiated placing additional hardships on the business community.

A detailed flood damage survey of Fort Kent was conducted in 1973 to determine the extent of damages that would be experienced in a recurrence of the record flood stage or even higher stages. This survey consisted of a field examination, personal interviews with local officials, and discussions with property owners affected by flooding. Based on this survey, it is estimated that a recurrence of the flood level of April 1973 would cause losses of $1.40 million under current conditions. Losses at various stages of flooding were combined with stage-frequency data to derive annual losses of $261,290. With the project, annual flood control benefits were estimated to be $208,630. Furthermore, at a stage level of +3, potential total loss would be $2.52 million.

REDEVELOPMENT BENEFITS

In labor market areas which have been designated as Redevelopment Areas, Senate Document No. 97 of the 87th Congress directs that the project benefits shall be considered to be increased by the value of the labor and other resources required for project construction and expected to be used in project operation, project maintenance, and additional area employment during the construction of the project. Otherwise, such labor and resources would be utilized or underutilized.

The records of this office indicate that, in the average civil works project, the labor cost approximates 27 percent of total construction costs. The construction cost of the Fort Kent project is currently estimated at $1,300,000. Labor's share amounts to $351,000.

However, it is regular practice for a contractor to maintain a skilled skeleton crew and fill the rest of his requirements from the local labor pool. It is estimated that 75 percent of the laborers will be locally hired for this project. While not all of this labor will come from the rolls of the unemployed, the jobs that they leave will be fulfilled by either the unemployed, or the underemployed; thus 75 percent is used. It is estimated that the bulk of the work will be accomplished in the first

year. With interest at 5-7/8 percent, the derivation of the annual redevelopment benefits is as follows:

$351,000 x .75 = $263,250 locally hired labor wages

$263,250 x .062340 (Capital Recovery Factor, 50 yr. life) = $16,411 average annual benefit

No benefit is considered for labor engaged in maintenance and operation of the project after construction; the need is small and the work will be handled by the regular public work force of the community.

SECTION C

GEOLOGY, EMBANKMENTS

FOUNDATIONS AND CONCRETE

ST. JOHN RIVER FLOOD CONTROL

FT. KENT, MAINE

LOCAL PROTECTION PROJECT

SECTION C.

GEOLOGY, EMBANKMENTS, FOUNDATIONS AND CONCRETE

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ST. JOHN RIVER FLOOD CONTROL

FT. KENT, MAINE

LOCAL PROTECTION PROJECT

SECTION C

GEOLOGY, EMBANKMENTS, FOUNDATIONS

and CONCRETE

A. GEOLOGY

1. Investigations. Geological investigations for this project consisted of field reconnaissance and subsurface explorations. The explorations included eleven drive-sample borings and a test pit in the project foundation area and four off-site test pits at potential sources of impervious fill materials.

2. Site Geology. The project is sited on low terraces along the right bank of the St. John River and the left bank of the Fish River. The terraces consist of stratified deposits of silts, sands and gravel. These deposits overlie a glacial till deposit of unknown thickness which in turn overlies the deeply buried bedrock. Subsurface water levels are 2 or 3 feet above the adjacent river levels.

3. Construction Materials. Materials from the required earth excavations will be utilized to the extent practicable in the random fill zones of the dike. All other fill materials will be furnished by the contractor from off-site sources. Impervious fill material is available from undeveloped sources in glacial till deposits at the higher elevation south of the St. John River within a 5-mile haul. Materials for gravel bedding and gravel fill are available from undeveloped or inactive sources within a 20-mile haul. Rock suitable for use as stone protection is not available locally and must be obtained from commercial sources at a haul of about 70 miles.

B. EMBANKMENTS AND FOUNDATIONS

4. Characteristics of Foundation Materials.

a. Description and Distribution. The principal formation in the foundation for this project is a loose to moderately compact deposit of sandy silt and silty fine sand interbedded with strata of gravelly silty sand and silty sandy gravel. There is generally a capping of from 2 to 5 feet of loose to moderately compact gravelly silty sand over this deposit.

In places, the foundation area has been filled with up to 15 feet of granular soils frequently mixed with significant amounts of trash. The silt formation is underlain by a glacial till deposit of unknown thickness. Reference is made to Plates C-1 and C-2 showing the engineering log profile for the dike and to Plates C-3 and C-4 for the gradation curves for the foundation silts and sands and gravels.

b. Permeability. The following ranges of coefficients of permeability have been estimated on the basis of visual examination of the foundation soil samples and their gradation characteristics.

Soil Types	K_v cm/sec	K_H/K_v
Silts	1 to 10x10-4	16
Sands & Gravels	1 to 500x10^{-4}	9
Glacial Till	Ql to 1x10^{-4}	4

c. Consolidation. The foundation sands and gravel and the glacial till are materials exhibiting low compressibility. While the silts are moderately compressible, they consolidate rapidly with settlements occurring as loads are applied. No significant post-construction settlements are anticipated.

d. Shear Strength. On the basis of experience with foundation soils of similar character, it is estimated that foundation shear strengths within the anticipated range of normal stresses will equal or exceed those described by the following parameters:

Soil Type	ø Degrees	C Tons/ sq. ft.
Silts	25	0
Sands & Gravels	30	0
Glacial Till	30	0

5. Design of Dike.

a. Criteria. The design of the dike embankment was developed in accordance with the criteria set forth in Engineer Manual EM-1110-2-2300 "EARTH EMBANKMENTS" and the other manuals and technical publications referred to therein.

b. Selection of Embankment Sections. The principal factors affecting the selection of the embankment sections for the dike were the wide variation in permeability of the foundation soils, the presence of trash fill in certain reaches, the low height of the dike on the land side and the availability of impervious fill material. Typical dike sections are shown on Plate 6 of the report.

c. Characteristics of Embankment Materials.

(1) Random Fill. To the extent that they are available, suitable materials from the required excavations will be used in the construction of the random fill zones of the dike. For the most part these materials will consist of sandy silt. It is expected that the compacted random fills will be similar to the silt formation in the foundation with respect to permeability but will have a shear strength equivalent to that of the compacted impervious fill.

(2) Impervious Fill. Impervious fill material will be furnished by the contractor and will consist of gravelly silty sand meeting the following gradation specifications:

Sieve Size (U.S.Standard)	Percent Passing by Dry Weight
6-inch	100
No. 4	50-80
No. 200	20-50

The gradation curves for typical samples of available impervious fill materials, together with this gradation specification, are shown on Plate C-5. It is estimated that the compacted impervious fill will have coefficients of permeability of about 0.1×10^{-4} cm/sec and will develop an angle of internal friction of at least 30 degrees within the anticipated normal stress range.

(3) Gravel Fill. Gravel fill material will be furnished by the contractor and will consist of sandy gravel meeting the following gradation specification:

Sieve Size (U.S.Standard)	Percent Passing by Dry Weight
6-inch	100
No. 4	40-70
No. 200	0-10

d. Control of Seepage.

(1) Through Seepage. Seepage through the dike embankment will be controlled by the arrangement and differences in permeability of the impervious and random fills and by a sand gravel fill toe drain.

(2) Foundation Seepage. Seepage through the dike foundation will be controlled through the construction of impervious fill against the excavated river bank slope and by the toe drain.

e. Stability. The dike slopes have been established on the basis of providing adequate safety against shear failure in the embankment or its foundation..

f. Settlements. It is expected that settlements within the dike embankment and its foundation will be of insignificant magnitude and will occur principally during construction.

g. Slope Protection.

(1) The design river velocity along the riverside slope of the dike is 6 feet per second. A D_{50} size of 0.5 feet, therefore, is required for the stone protection. The following gradation specifications for stone protection and gravel bedding materials were developed in accordance with the criteria presented in Engineer Manual EM1110-2-1601 "Hydraulic Design of Flood Control Channels".

(2) Stone Protection.

Percent Lighter by Weight (SSD)	Limits of Stone Weight lbs.
100	30-75
50	15-50
15	5-30

(3) Gravel Bedding.

Sieve Size (US Standard)	Percent Passing by Dry Weight
6-inch	100
1½-inch	60-85
No. 4	30-60
No. 200	0-10

6. Foundations for Concrete Structures.

a. Pumping Station. The pumping station will be founded in an existing fill of loose to moderately compact gravelly silty sand with roots and fragments of brick, wood and glass. This fill overlies about 5 feet of loose sandy (fine) silt, 10 feet of moderately compact gravelly silty sands and silty sandy gravel and an undetermined depth of moderately compact to compact gravelly silty sand (glacial till). The foundation is considered capable of sustaining net bearing loads up to one ton per square foot.

Settlement due to the consolidation of the silt layer under the loading imposed by the structure alone is estimated to be on the order of 3 inches with no significant differential settlement. This increment of settlement will occur during construction of the pumping station. The dike embankment adjacent to the pumping station will be constructed after that structure is completed. The loading imposed by the embankment on the silt layer will cause additional settlement of the pumping station in that portion nearest the dike. It is estimated that this differential post-construction settlement of the pumping station will be on the order of 2 inches.

b. Foundation Depths. All foundations for concrete structures will be at least 6½ feet below adjacent finished grade for frost protection.

7. Construction Considerations.

a. Removal of Unsuitable Foundation Materials. The dike foundation will be stripped to remove topsoil which will be salvaged to the extent practicable for use in the permanent work. Where the foundation contains trash fill, such material will be excavated and removed from the site.

b. Compaction. Materials for compacted fills will be spread in 6-inch layers and each layer will be compacted by at least 6 coverages of the tread of a crawler-type tractor weighing not less than 35,000 pounds and exerting a tread pressure of at least 9 pounds per square inch. Moisture contents during compaction will be such as to prevent excessive rutting or dust and to permit satisfactory operation of the hauling and compaction equipment.

C. CONCRETE

8. The proposed project will require approximately 100 cubic yards of concrete for the construction of a pumping station. The concrete will be subjected to severe climatic conditions with alternate cycles of freezing and thawing during the winter months. Therefore, for durability, airentrained concrete is considered mandatory. The concrete will not be subjected to high velocity flows of water. Superior strength (4,000 psi) concrete will be required to provide adequate durability. Considering the relative small quantity of concrete involved, the specifications will provide for the use of a manual concrete plant and ready-mixed concrete and the aggregate investigation has been confined to established commercial sources. Madawaska Brick and Block, The Lane Construction Corporation and Lynn Sand and Stone Company were investigated as potential suppliers of aggregate.

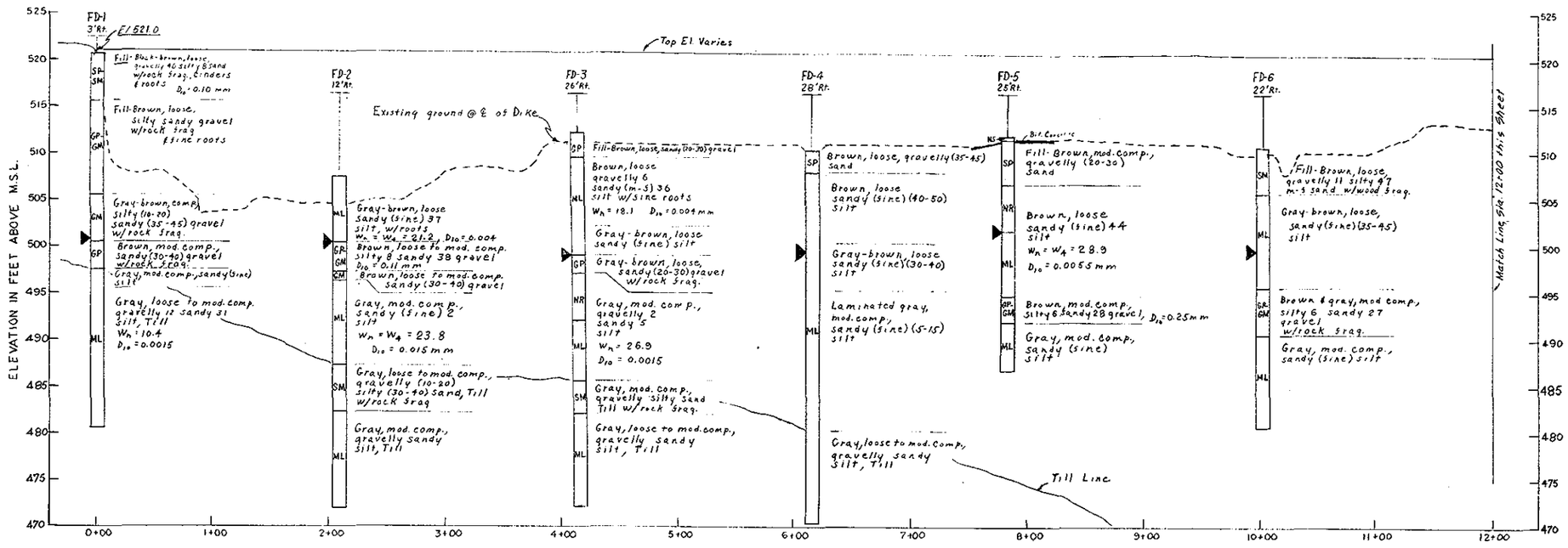
Aggregate from the Madawaska source has a record of poor gradation and this source does not have the facilities to change or adjust the screens to conform to accepted Government specifications. Lane Construction Corporation has a haul distance which exceeds the limitation for transit-mix hauling. Lynn Sand and Stone is a Massachusetts based firm of good quality aggregate with rail capabilities of hauling the aggregate to the project site.

9. Madawaska Brick and Block Company operates an aggregate processing plant and a manual control transit-mix type concrete plant located at Frenchville, Maine, approximately twenty miles haul distance to the project site. The quoted plant prices and delivered prices respectively are $3.00 and $4.00 per yard for 1½ inch, $4.00 and $5.00 per yard for 3/4 inch. Fine aggregate is $5.00 and $6.00 per yard.

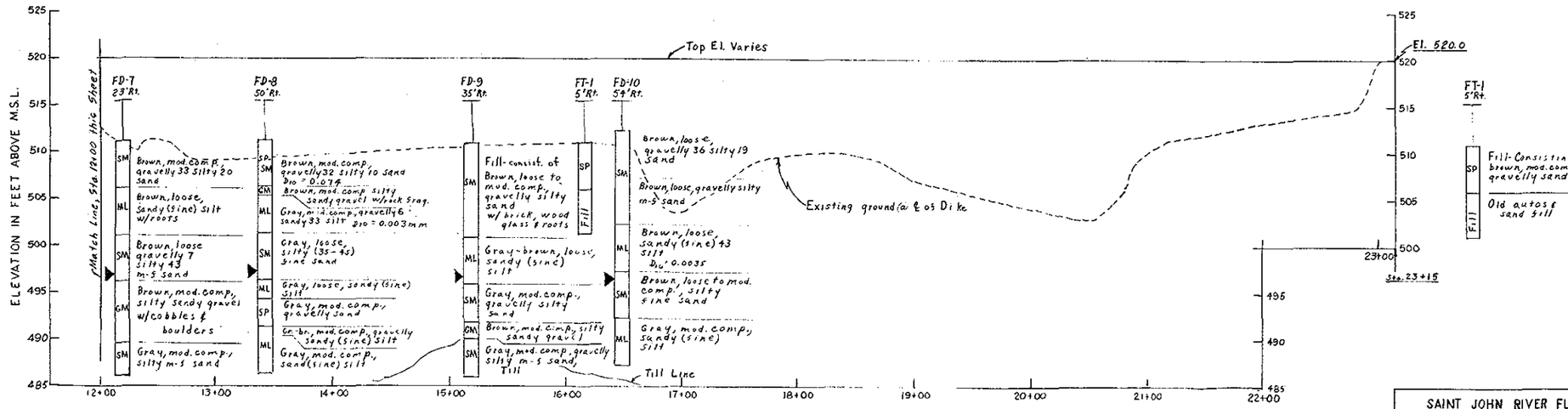
10. Lane Construction Corporation operates a coarse aggregate processing plant and a manual control transit-mix type concrete plant located at Presque Isle, Maine, approximately seventy miles haul distance to the project site. The quoted plant prices and delivered prices respectively are $3.20 and $6.95 per ton for 3/4 inch to 7/16 inch, and $2.70 and $6.45 per ton for 1 7/8 inch. The fine aggregate is obtained from Mosquito Mountain in Prospect, Maine and is delivered by rail to the Presque Isle facility at $5.50 per ton with site delivery cost at $9.25 per ton. There is an approximate delivery time of 1½ hours for transit mist, and an on-site mixing facility is not considered feasible for such a small quantity of concrete. The aggregate from the Presque Isle site has been tested for its previous owner, McKay Rock Products, Inc. for Loring A.F.B. and can be found in "Test Data - Concrete Aggregate in Continental United States," Volume 5, under Latitude 47°N - Longitude 68°W.

11. Lynn Sand and Stone Company operates an aggregate processing plant located in Lynn, Massachusetts. It has rail facilities capable of hauling aggregate the 435 miles to the project site. Quoted plant prices and delivered prices respectively are $2.70 and $19.50 per ton for 1 inch, $3.00 and $19.80 per ton for 3/4 inch, $3.25 and $20.05 per ton for 1/2 inch and $4.00 and $20.80 per ton for fine aggregate. This high quality aggregate has been tested and recorded with "Test Data - Concrete Aggregate in Continental United States," Volume 5, under Latitude 42°N - Longitude 71°W.

12. It is recommended that due to the small quantity of concrete for this project, a local company with ready-mix facilities within the economic haul distance is desirable. Madawaska Brick and Block meet these requirements. The concrete will be designed with a low water cement ratio and high entrained-air content to compensate for the relatively poor quality of the coarse and fine aggregate in this geographical location.



ENGINEERING LOG PROFILE ALONG DIKE & (LOOKING TOWARD SAINT JOHN RIVER)



ENGINEERING LOG PROFILE ALONG DIKE & (CONT.) (LOOKING TOWARD SAINT JOHN RIVER)

LEGEND FOR ENGINEERING PROFILES

FD	foundation test boring
FT	foundation test pit
br.	brown
gr.	gray
mod.	moderately
comp.	compact
m-s	medium to fine
w/	with
GM	soil symbol, Unified Soil Classification System.
D_{10}	Effective grain size in millimeters.
W_f	Natural water content determined for that portion of the soil passing the No. 4 U.S. standard sieve.
W_n	Natural water content of sample except for certain soils containing gravel for which W_n represents the sample from which portions of the coarse gravel sizes have been removed
(10-20)	A range of numbers in parentheses following a soil component in the description of a soil represents the estimated limits between which lies the percentage, by weight, of that component in the soil as determined by visual inspection.
12	A single numeral following a soil component in the description of a soil represents the percentage, by weight, of that component in the soil as determined by a mechanical analysis

SCALE: HORIZ. 1"=40' VERT. 1"=5'

SAINT JOHN RIVER FLOOD CONTROL

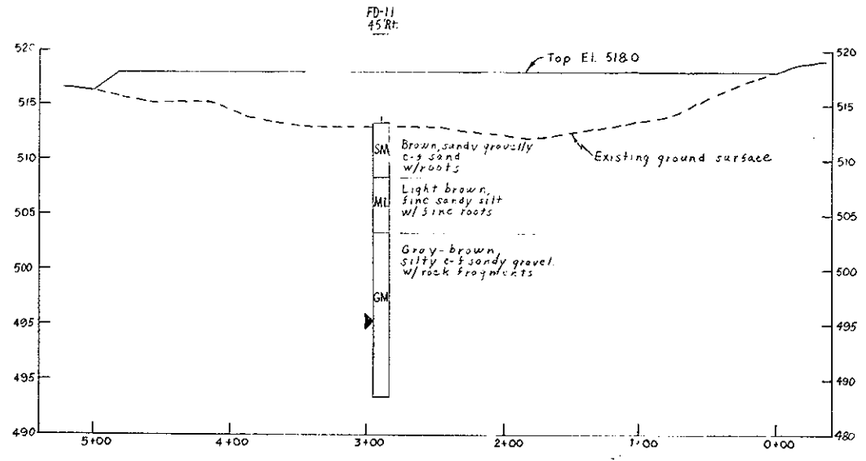
FORT KENT, MAINE

LOCAL PROTECTION PROJECT

ENGINEERING LOG PROFILES

SAINT JOHN RIVER MAINE

PLATE C-1



ENGINEERING LOG PROFILE ALONG DIKE & IN VICINITY OF BLOCK HOUSE
(LOOKING TOWARD FISH RIVER)

SCALE: HORIZ. 1"=40'
VERT. 1"=5'

SCALE: HORIZ. 1"=40'
VERT. 1"=5'

SAINT JOHN RIVER FLOOD CONTROL

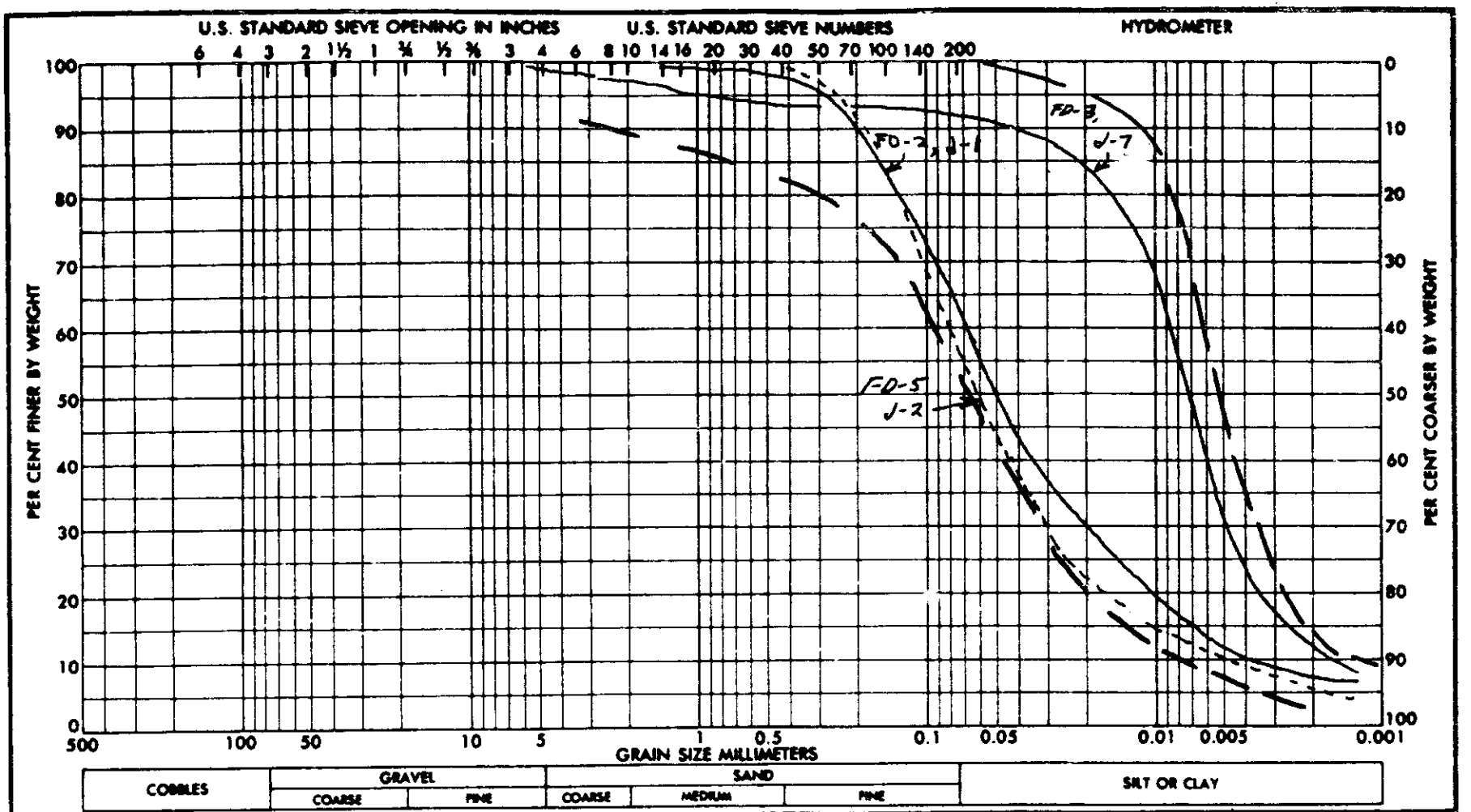
FORT KENT, MAINE

LOCAL PROTECTION PROJECT

ENGINEERING LOG PROFILES

SAINT JOHN RIVER MAINE

PLATE C-2



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

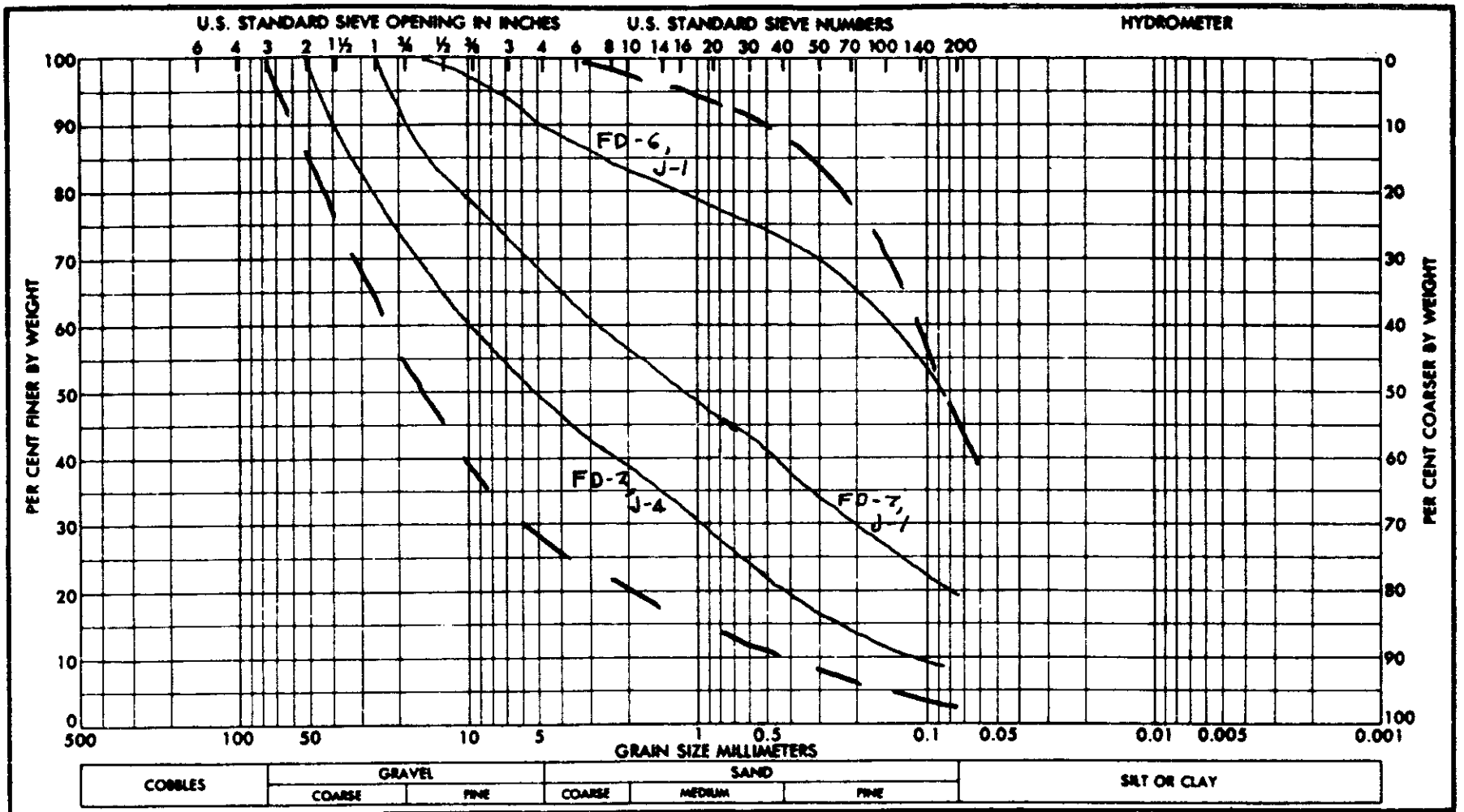
PROJECT Local Flood Protection
St. John River, Ft. Kent, Maine
Dike Foundation
Silts

PLATE C-3

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—700-124



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

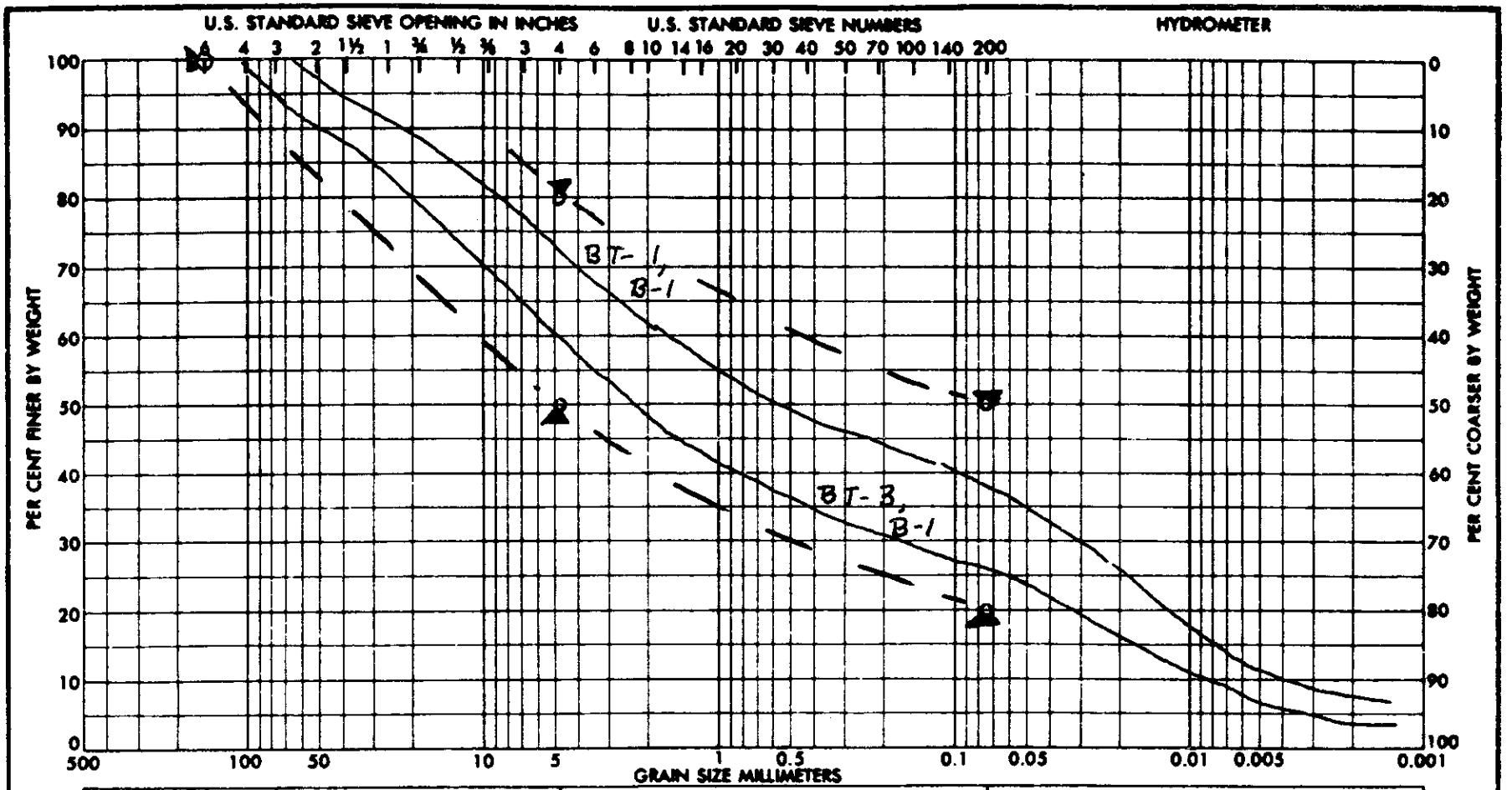
PROJECT Local Flood Protection
St. John River, Ft. Kent, Maine
AREA Dike Foundation
DESCRIPTION Sands & Gravels
DATE

PLATE C-4

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 O—703-136



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

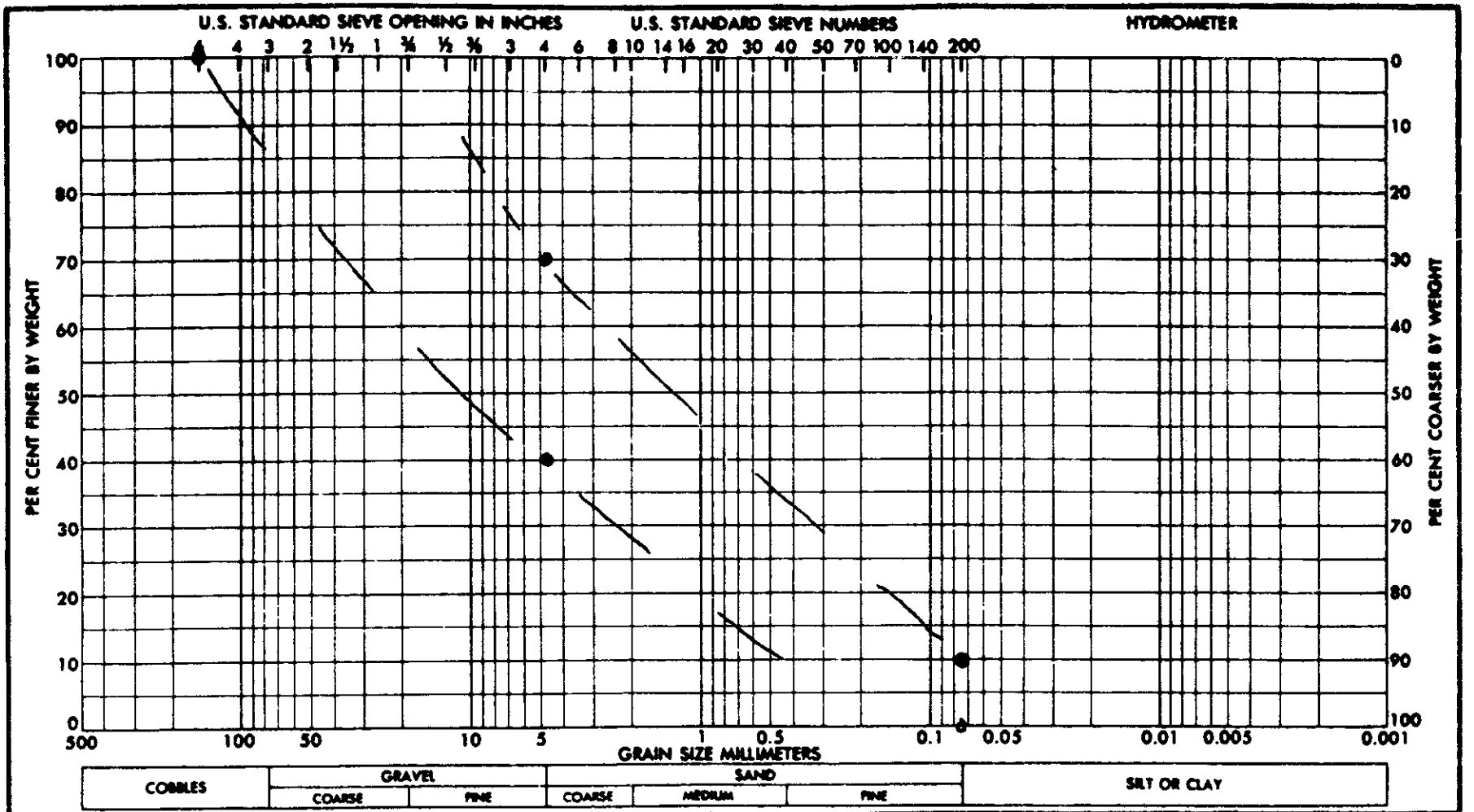
PROJECT Local Flood Protection
St. John River, Ft. Kent, Maine
Impervious Fill
Spec. & Samples

PLATE C-5

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 O—750-134



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

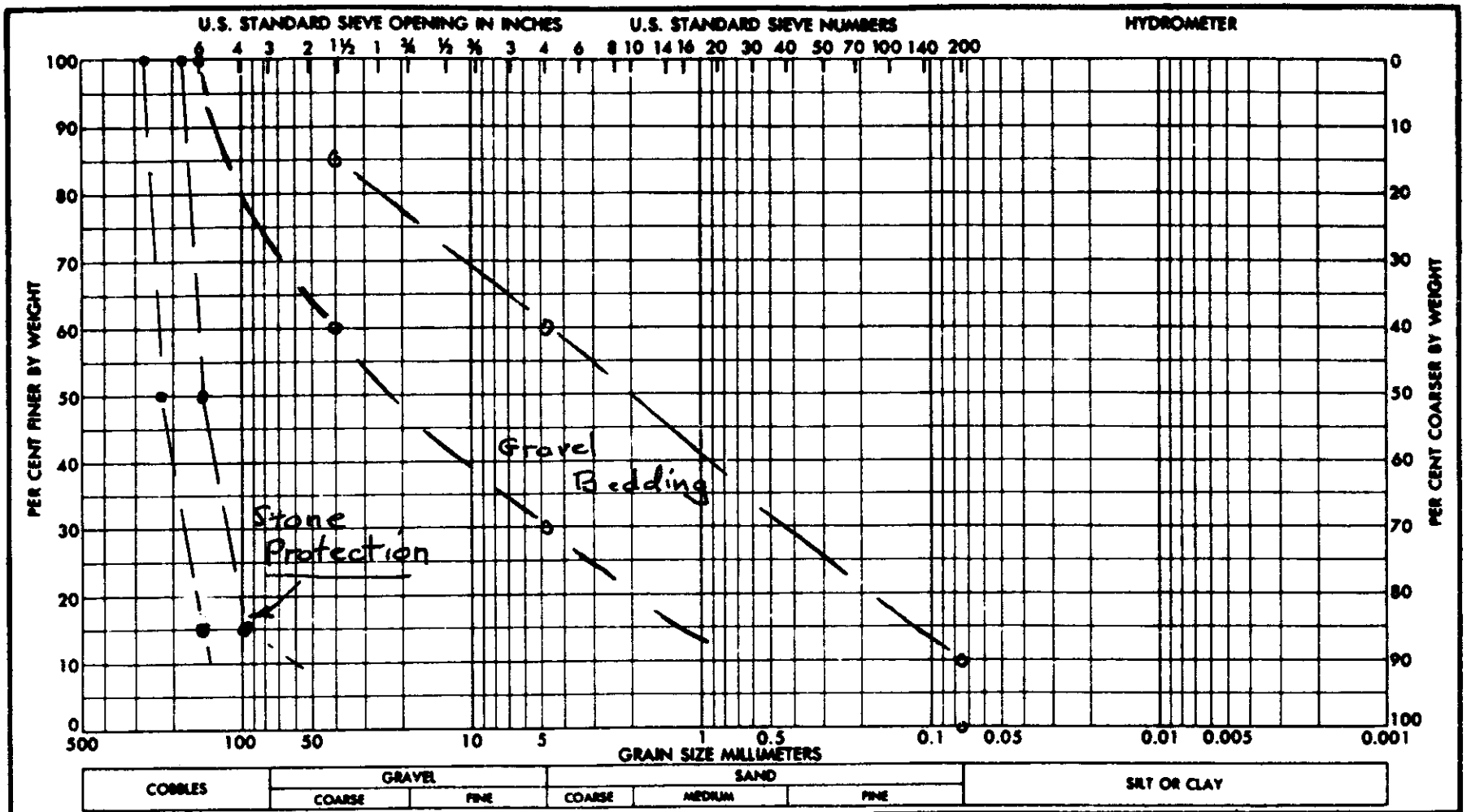
PROJECT Local Flood Protection
St. John River, Ft. Kent, Me.
ARMY SPEC.
BORING NO. Gravel Fill
DATE

PLATE C-9

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—709-126



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

PROJECT Local Flood Protection
St. John River, Ft. Kent, Me.
AREA SPEC.
DESCRIPTION Gravel Bedding &
DATE Stone Protection

PLATE C-7

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 O—700-134

(1)

FT. KENT, ME.
Loc. Prof.

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-1	520±	J-1	0 - 5.0	SP-SM	40	52	8	0.095														
		J-9	25.0 - 30.0	ML	12	31	57	0.0015														
		J-10R	"	"								10.4										
FD-2	507±	J-1	0 - 5.0	ML	0	37	63	0.004														
		J-2R	"	"								21.2										
		J-4	7.0 - 10.0	GP-GM	54	38	8	0.110														
		J-8	15.0 - 20.0	ML	0	2	98	0.0015														
		J-9R	"	"								23.8										
FD-3	512±	J-3	5.0 - 10.0	ML	6	36	58	0.004														
		J-4R	"	"								18.1										
		J-7	20.0 - 25.0	ML	2	5	93	0.0015														
		J-8R	"	"								26.9										
FD-5	509±	J-2	10.0 - 15.0	ML	0	44	56	0.0055														
		J-3R	"									28.9										
		J-5	17.0 - 19.7	GP-GM	66	28	6	0.250														
FD-6	512±	J-1	0 - 5.0	SM	11	42	47	-														
		J-4	15.0 - 17.0	GP-GM	67	27	6	0.210														
FD-7	513±	J-1	0 - 5.0	SM	33	47	20	-														
		J-4	10.0 - 15.0	SM	7	50	43	-														
FD-8	510±	J-1	0 - 5.0	SP-SM	32	58	10	0.074														
		J-4	6.0 - 10.0	ML	6	54	40	0.003														

PLATE C-8

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

(2)

FT. KENT, ME.
Loc. Plot.

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.	
FD-10	511±	J-1	0-5.0	SM	36	45	19	—														
		J-3	10.0-15.0	ML	0	43	57	0.0035														
		J-4R	"	"								27.6										
BT-1	-	B-1	0-2.0	SM	28	34	38	0.004														
BT-3	-	B-1	0-3.0	SM	32	33	25	0.009														

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

PLATE C-9

SECTION D

REAL ESTATE

SECTION D

REAL ESTATE

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APPENDIX I

SECTION D

REAL ESTATE

1. PURPOSE

The purpose of this report is to estimate the acquisition costs of the real estate interests required for the proposed Fort Kent, Maine, Local Protection Project, as of 23 August 1974.

Specifically set forth in this report is the estimated market value of the lands and improvements for all of the properties required for project purposes. The properties required for project purposes are based upon six preliminary plans and drawings entitled WATER RESOURCES DEVELOPMENT PROJECT, FORT KENT, MAINE, LOCAL PROTECTION PROJECT, SAINT JOHN RIVER, MAINE.

Under authority contained in Section 205 of the 1948 Flood Control Act, as amended, local interests are required to provide all lands, easements, and rights of way necessary for the construction of this project.

2. LOCATION

The proposed project will be located in the Town of Fort Kent, Aroostook County, Maine. It is proposed to construct a dike protection barrier in and along the Saint John River just upstream of its confluence with the Fish River.

3. AREA DESCRIPTION

The Town of Fort Kent is situated in the most north central part of Maine, at the confluence of the Saint John and Fish Rivers. The Town is bisected by the northerly flowing Fish River which is spanned by the Main Street Bridge. In Fort Kent is the beginning of U.S. Route #1 which ends in Key West, Florida. There is a U.S. Customs Inspection Station at the International Bridge, on the Saint John River, which is a port of entry between the United States and Canada. It is considered to be on the shortest route from Maine to Quebec City, Canada, a distance of about 170 miles. Fort Kent is bounded on the north by the Saint John River, being the international boundary between the United States and Canada. There are numerous small villages and towns to its west and south,

with Madawaska being the largest town about 20 miles to the east. The nearest commercial airport is located about 60 miles south in Presque Isle, Maine.

This area is chiefly devoted to lumbering, farming, hunting, and sport fishing. Today, potato farming is the primary industry in this area, and a considerable number of inhabitants are engaged in the lumber industry.

In spite of a small population of about 4,000, Fort Kent had adequate educational facilities, including the University of Maine at Fort Kent, John F. Kennedy College, and area community high school, and two elementary schools.

Although Fort Kent is a remote town, thousands of tourists visit the Fort Kent Blockhouse each year. The boundary dispute, known as the "Bloodless War", which arose between the French Acadians and the local people, necessitated the building of such a fort in 1839. In spite of the strong fortifications, no battles were fought and the dispute was settled peacefully as the result of the Webster-Ashburton Treaty of 1842. The fort site has adequate picnic and parking facilities.

4. DESCRIPTION OF PROJECT SITE

The proposed protective barrier for the most part will be situated in and along the Saint John River at the rear of the Town's central business area. The area is predominantly devoted to commercial uses. The construction of the easterly portion of the barrier alignment is situated to the rear of a built-up better type residential neighborhood that is subject to flooding. At the easterly portion of the protective works near the confluence of the Fish and Saint John Rivers is historic Fort Kent Blockhouse. Although the site of the fortification is elevated above the flood of record, the lands immediately surrounding it are also subject to inundation. It is proposed to raise in-place the Fort Kent Blockhouse access road. The raising in-place of this road will afford protection to most of the historic site as well as the southeasterly portion of the Town. The estimated project area is about 9 acres.

5. PROJECT DESCRIPTION AND LAND REQUIREMENTS

The subject dike will begin at a point on the Saint John River bank about 960 feet west of the bisecting International Bridge. This segment of the site contains about 2.70 acres of which 1.50 acres is water. Although there are 6 improved properties in this alignment, no buildings will be required for the project purposes. This area is considered to be the outskirts of the built-up area of the Town.

The second segment of the dike lies east of the bisecting International Bridge. There are about 5.64 acres in this segment of which 3.69 acres lie in the River. There are 28 ownerships in this alignment, of which only one will be required in fee. The building to be acquired is a modest dwelling which lies in the center line of the proposed dike. The lands required in this area are mostly River bank, and are situated to the rearmost portion of each tract. This segment of the dike terminates at a point about 400 feet southwest of the confluence of the Saint John and Fish Rivers. There are 2 sheds and 2 one-stall garages that are planned to be relocated in near proximity to their existing location.

The third segment of the protective barrier is noncontiguous to the prior described segment and begins at a point about 130 feet east of the terminating point of segment 2. It is in the form of road raising and will extend from the Historical Blockhouse area to a point about 50 feet north of the Main Street Bridge which spans the Fish River. There are no buildings required in this area.

One driveway to a private residence will be affected. Lands required immediately outboard of the road raising are those lands utilized for tourist parking to the Historic Blockhouse. This road raising area contains about 0.58 acre. It is recommended that all of the lands required for project purposes be acquired in the form of permanent easements with the exception of one residential tract which will be acquired in fee.

Based upon only preliminary tract ownership data, it is projected that the protective works will require partial takings of land from a total of 36 ownerships and one additional ownership will be acquired in its entirety.

6. BORROW AREA

No land has been included in this report for borrow purposes.

7. RELOCATIONS - Roads and Public Utilities

No roads nor public utilities will require relocations. About 2,000 feet of the main sanitary sewer which services this area of Fort Kent lies just inboard of the toe of the proposed dike. About 80 feet of that sewer line will be replaced with ductile iron pipe where it extends beneath the most easterly end of the proposed barrier.

8. PRESENT USE AND HIGHEST AND BEST USE

Most of the land required for the protective alignment is classified as rear land and River bank, and lies to the rear of 30 commercial tracts and 7 residentially improved tracts. About 2,800 square feet of paved parking area in the proposed dike area is currently in use for hotel patron parking, and about 2,000 square feet is devoted to use of a residential unit. The highest and best use of the land areas required for project purposes are considered to be their present use.

9. MINERAL DEPOSITS

A recent field inspection discloses no evidence of commercial mining or gravel nor the deposits of any minerals within the project area.

10. CROPS

Timber - There are a few small stands of nonmerchantable species, mostly elm. Several of these trees have been killed off either by flood damage or disease. However, the quality and quantity of the healthy growth are considered inadequate to require inclusion of any special allowance for merchantable timber.

Agriculture - There is no evidence of any commercial agricultural efforts in the project area.

11. UTILITIES AND SERVICES

Electric power, telephone, Town water, and sanitary sewers are available to all properties within the project area.

12. WATER RIGHTS

Suggested interim guide lines for shore land zoning and subdivision control have been distributed to municipalities in Maine by the Shore Lands Zoning Project, University of Maine, and Department of Environmental Protection, State Planning Office. The guide lines' are intended to assist communities with municipal shore land zoning.

All buildings and structures except those requiring direct access to the water as an operational necessity shall be set back at least 100 feet from the mean annual high water line. Those standards may be waived by a municipality because of existing structures, and those requiring direct access to the water as an operational necessity. A recent inspection and discussion with the Town Manager revealed no ownerships in the project area require access to the River for their operational needs.

13. ZONING

The area along the main dike is zoned both business and residential. The business zone extends along the entire length of Main Street, and the residential zone extends along Meadow Lane. In keeping with the Shore Land Zoning project, the Town adopted shore land zoning as of July 1974, in order to fulfill the Town's obligation to regulate construction in the flood plain for purposes of protecting the environment. Mapping and printing of the ordinance are in process.

14. ESTIMATED TAX LOSS

A review of the assessment records of the properties that are within the proposed project area indicate that the estimated annual tax loss to the Town of Fort Kent is about $2,000.

15. PROTECTION AND ENHANCEMENT OF ENVIRONMENT

In accordance with instructions set forth in teletype DA (DAEN) R 1913062, dated October 1971, subject "EO 11953, 13 May 1971, Protection and enhancement of environment", a study has been made in the project area which revealed that there is one Federally-owned Port of Entry Customhouse which is located on the southerly access shore at the entrance of the International Bridge. The Customhouse has no known historic significance and will not be affected by the proposed construction. It is reliably reported that the Federal Government plans to replace the structure upon completion of the proposed protective dike. The Customhouse is considered to be inadequate and obsolete for current requirements.

16. MUNICIPALLY-OWNED FACILITY

Section III of the Act of Congress, approved 3 July 1968 (P.L. 85-500) authorized the protection, realteration, reconstruction, relocation or replacement of municipally-owned facilities. In accordance with instructions set forth in this Act, a study has been made in the project area which revealed that there are no municipally-owned structures that would be affected by the construction of this project.

It is noted that a minute area of land at the northeasterly corner of a local fire station site will be raised slightly in the form of a road shoulder as part of the raising in-place of the access road to the Fort Kent Blockhouse. The State-owned Blockhouse will remain uneffected and only the road shoulders will be raised in the parking lot and public picnic areas.

17. ACQUISITION COSTS

Experience in this office in acquiring properties in other Civil Works Projects indicates that acquisition costs will average approximately $1,500 per tract. These costs include mapping, surveys, legal descriptions, title evidence, appraisals, negotiations, closing and administrative costs, or possible condemnation. The number of ownerships within the project area were computed from local assessor's maps, therefore are considered reasonably accurate. The number of tracts affected by the project in Fort Kent were estimated by counting the number of improvements and also through discussions with local officials. Based on this preliminary survey the number of ownerships and acquisition costs are estimated as follows:

37 Ownerships @ $1,500 = $55,500.

18. RECOMMENDATIONS AND ESTATES TO BE ACQUIRED

It is recommended that the permanent easements be acquired on all of the lands that lie within the dike areas. The only exception is the residentially improved (Michaud) property that is situated entirely within the proposed alignment which will be acquired in fee. Most of the property owners were interviewed and are in concurrence with the proposed plan of acquisition.

The value of the permanent easements are based upon the loss in utility of the lands involved and predicated upon the imposition of the owner's rights, title, and use of the land. The estimated value of the easements are predicated upon the "Before and "After" appraisal technique.

The subject areas, with exception of fee acquisition of one ownership, to be encumbered by permanent easements are generally low River bank land and low rear commercial and residentially improved lands. The land areas are susceptible to serious flooding, and it is doubtful that improvements would be permitted to be erected in this flood plain area.

Preliminary investigations indicate that after the imposition of the easements, the highest and best use of the majority of the properties within the proposed acquisition program will not be materially affected. However, it is recognized and historically known that the mere existence of the imposition infers a restrictive aspect of a perpetual cloud on the title which runs with the property.

From all of the facts set forth in this report, the damages and diminution in value of the properties effected, with the exceptions noted, are considered to be nominal. Therefore, a fair and reasonable value of $0.10 per square foot is assigned to those unimproved permanent easement areas.

19. TEMPORARY CONSTRUCTION EASEMENTS

Temporary easements of varying widths are required for work areas. For the most part, they will run contiguous to the inboard toe of the proposed dike. Exceptions to their contiguity are at certain points where their close proximity of structures would interfere. These areas of temporary easements will consist of about one acre of land.

The costs of temporary easements are predicated upon a fair return of invested capital and estimated tax for the use of the owner's land for a one year period, and are estimated at $6,500.

20. RELOCATION ASSISTANCE

Public Law 91-646, Uniform Relocation Assistance and Real Property Act of 1970, provides for uniform and equitable treatment of persons displaced from their houses, businesses, and farms by Federal and Federally assisted programs. In accordance with this law an estimate of $26,000 is included in this report to cover the implementation of this Act.

21. SEVERANCE DAMAGES

Severance damages usually occur when partial takings are acquired, and when the remaining portion may not be subject to full economic development. The severance damages are measured and estimated on the basis of "Before and After" appraisal methods, and will reflect actual value losses incurred to the remainder as a result of partial acquisition. With the exception of one fee acquisition all of the acquisitions required for the project will consist of partial takings. The estimated severance damages for the entire project are $20,000.

22. CONTINGENCIES

The contingency allowance of 15% is considered to be reasonably adequate to provide for possible appreciation of property values for the time of this estimate to acquisition date, for possible minor line adjustments, or for additional hidden ownerships which may be developed by refinement of taking lines, for adverse condemnation awards, and to allow for practical and realistic negotiations.

23. EVALUATION

A thorough search of the records was made in the Town of Fort Kent to obtain comparable sales data. In addition real estate brokers, local officials, and knowledgeable persons were interviewed to obtain data and value estimates. This evaluation is based upon the knowledge of the general real estate market in the area which was obtained from this study and analysis. All of the properties affected within the project area have been inspected from the exterior. A random sample of interiors were also inspected when owners were interviewed.

The trend of property values in the Town of Fort Kent appear to be static as evidenced by the few new construction starts and limited real estate transfers. For the most part, business properties and commercial establishments that are affected by the proposed project purchase area have remained in the same family ownerships for many years. In 1973 and 1974, 140 and 160 sales were recorded respectively for the entire Fort Kent area. Those sales were of mostly large rural and remote agricultural tracts and seasonal dwelling sites located at considerable distance from the project area. It is further noted that, based upon this recent sales study, no sales were recorded in the flood prone proposed project purchase area. Therefore, the sales activity in the Town are considered not indicative nor to have any influencing market value criteria in the proposed project purchase area.

The assigned values used in this estimate are for the most part nominal which reflect for both small and large tracts of land with differing characteristics. The estimated real estate market value and total real estate costs are as follows:

24. REAL ESTATE COST SUMMARY

SEGMENT #1 & #2 - RIVER DIKE

Improvements

1	Dwelling	$18,000	
2	One-Stall Garage	2,000	
2	Sheds	500	
1	Paved Parking Area	1,500	
1	Gas Tank Rack	500	
	Total Value of Improvements		$22,500

Land - Permanent Easement/Fee

4.80 Acres	Rear Residential/Commercial	$35,000	
3.52 Acres	River Bed	-0-	
0.17 Acre	Access Road	-0-	
0.05 Acre	Improved Homesite	3,500	
8.54 Acres	Total Value of Land		$38,500

Total Value of Land & Improvements Segment #1 & #2 $61,000

SEGMENT #3 - ROAD DIKE

Land - Permanent Easement

0.57 Acre	Public Land	$ -0-	
0.01 Acre	Choice Residential	500	

Total Value of Land Segment #3 $ 500

TOTAL VALUE OF LAND & IMPROVEMENTS SEGMENTS #1, #2, & #3 $61,500

COST SUMMARY

Land and Improvements	$ 61,500
Temporary Construction Easements	6,500
Severance Damages	20,000
Relocation Assistance Costs	26,000
Acquisition Costs	55,500
Contingency (15% of Above = $25,425)	25,400
TOTAL ESTIMATED PROJECT REAL ESTATE COSTS	$194,900
ROUNDED TO	$195,000

ST. JOHN RIVER LOCAL PROTECTION
FORT KENT, MAINE

DETAILED PROJECT REPORT
FOR WATER RESOURCES DEVELOPMENT

PERTINENT CORRESPONDENCE

APPENDIX 2

PREPARED BY THE
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

APPENDIX 2

PERTINENT CORRESPONDENCE

APPENDIX 2

PERTINENT CORRESPONDENCE

TABLE OF CONTENTS

STATE OF MAINE
OFFICE OF THE GOVERNOR
AUGUSTA, MAINE
04330

KENNETH M. CURTIS
GOVERNOR

April 27, 1973

John H. Mason
Colonel, Corps of Engineers
Division Engineer
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Mason:

Thank you very much for advising me of the public meeting in Fort Kent on proposed flood protection improvements along the St. John River.

I hope the public meeting proves a successful one so that the planned project may proceed rapidly.

Sincerely,

Kenneth M. Curtis
Governor of Maine

KMC:njm
2896

Exhibit No. 1

STATE OF MAINE
OFFICE OF THE GOVERNOR
AUGUSTA, MAINE
04330

KENNETH M. CURTIS
GOVERNOR

June 21, 1974

John H. Mason
Colonel, Corps of Engineers
Division Engineer
Department of the Army
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Mason:

I appreciated your letter announcing postponement of the public meeting on the Saint John River Basin Study. I agree that the imminence of Congressional approval for preconstruction planning for the Dickey-Lincoln Hydroelectric Project seems appropriate basis for moving back the process on the River Basin Study.

Nevertheless, much as this particular action makes good sense and much as I support Dickey-Lincoln, I must emphasize that planning for the hydroelectric facility should not be in derogation of efforts to solve the more immediate flooding problems along the lower Saint John. Agricultural and commercial interests, not to mention residential property owners, along the River cannot await construction of Dickey for relief from what is coming to be almost annual flood damage.

Your assistance on this and other matters has been appreciated and I look forward to working with your office for the remainder of my term.

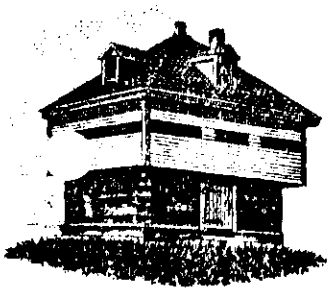
Sincerely,

Kenneth M. Curtis
Governor

KMC:njm

cc: Timothy Wilson

Exhibit No. 1



TOWN OF FORT KENT
FORT KENT, MAINE 04743
Phone 994-3090

September 3, 1974

Division Engineer
U.S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Mason:

This will certify assurance of the capability and willingness of the Town of Fort Kent to provide the requirements of local cooperation or reimbursement outlined in your letter of inquiry regarding the Fort Kent Local Protection Project dated 28 August 1974.

These requirements will be provided at the time requested by the Division Engineer, New England Division, Corps of Engineers, in accordance with applicable legislative authority governing the project.

We would also like to inform you at this time that local citizens have already formed a committee to assist the community in the acquisition of necessary lands and easements.

Sincerely yours,

Carlton Savage

Carlton Savage, Chm.

Elbridge Dumond

Elbridge Dumond

Wilmer Saucier

Wilmer Saucier

Fredrick Harvey

Fredrick Harvey

Emery Labbe

Emery Labbe

Exhibit No. 2

FORT KENT TOWN COUNCIL

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
John W. McCormack Post Office and Courthouse
BOSTON, MASSACHUSETTS 02109

JUL 31 1974

Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Sir:

This is our conservation and development report on the proposed local flood protection project, St. John River at Fort Kent, Maine. The project is being planned under authorization of the special continuing authority provided by Section 205 of the 1948 Flood Control Act, as amended by Public Law 874, 87th Congress. This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), in cooperation with the Maine Department of Inland Fisheries and Game. Use of information in this report for preparation of an environmental impact statement is encouraged.

The proposed plan of local protection includes construction of 2,300 feet of earthfill dike extending downstream from the International Bridge to an area near the Fish River-St. John River confluence. The dike would average 6 to 7 feet in height above the existing top of the bank. The riverside of the dike would be protected with 18 inches of graded stone, while the landside would be topsoiled and seeded. Portable pumps will be required to handle interior drainage, runoff, and seepage during flood periods. It is proposed to construct the dike with a top grade at elevation 516 mean sea level, or 1.8 feet above the record flood stage. A concrete wall and vehicular street gate would also be constructed in the vicinity of the International Bridge and the Blockhouse Road would be raised to provide protection up to the 100-year event.

The environmental setting which would be most affected by the project is the elm and scrub willow habitat bordering the St. John River. These trees provide little shade for the river due to its shallow nature and extended dry periods. Fishery resources are negligible in the immediate vicinity of Fort Kent due to the shallow nature of the river at this point. However, landlocked salmon and brook trout are important species both up and down river. Anticipated conditions without-the-project would be expected to undergo little change with perhaps the exception of additional domestic dumping along the river bank.

Environmental impacts with the project are expected to be minimal due to the low potential for wildlife in the area. Major damage would result from removal of trees and brush along the river bank. This would result in a habitat loss for birds and wildlife. Additional damage would result from siltation from the construction site, having an adverse effect on the fishery resources of the St. John River.

1 AUG 1974

Exhibit No. 3

This damage can be mitigated through careful planning with respect to (1) the date of project initiation, i.e, avoiding periods of high water for initial clearing and construction and (2) siltation and turbidity mitigation by the use of silt traps or other devices.

The removal of trees and brush should be avoided except in instances of direct interference with actual construction or its proposed effect. Trees and brush along the Fish River side of the dike, in particular, should be avoided based on their density and value as a wildlife habitat and their distance from the dike.

The U. S. Fish and Wildlife Service and the Maine Department of Inland Fisheries and Game believe that the Dickey-Lincoln project on the upper St. John River is not a viable alternative to this project. This project does not present the significant adverse impacts on fish, wildlife, and ancillary resources which will result with the construction of Dickey-Lincoln.

Possible beneficial effects may result from the discontinuation of siltation caused by frequent flood-caused erosion in the area to be protected.

Long-term adverse environmental effects are not anticipated.

In order to protect and preserve the wildlife and fishery resources in the area, we recommend that:

1. Initial clearing and construction be completed during the periods of minimum river flow, generally during the months of July and August or during periods of low winter flows.

2. Siltation traps and other protective devices be employed in order to reduce adverse effects caused by siltation and turbidity.

3. Removal of trees and brush be avoided except in instances of direct interference with construction or interference with the proposed effect of the dike.

4. That all project related activities be coordinated with the Maine Department of Inland Fisheries and Game.

5. That this project be constructed as planned.

Please advise us of any changes made in the project plans so that we can revise this report accordingly.

Sincerely yours,

Robert H. Shiley

ACTING Regional Director

Exhibit No. 3

Advisory Council
On Historic Preservation
1522 K Street N.W. Suite 450
Washington D.C. 20005

August 8, 1974

Mr. Joseph L. Ignazio
Chief, Planning Division
New England Division
Corps of Engineers
U.S. Department of the Army
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Ignazio:

The Advisory Council has received your letter of July 26, 1974, informing this office of the proposed local flood protection project at Fort Kent, Aroostook County, Maine, which project includes raising the existing roadway near the Fort Kent Blockhouse. The National Register property involved is the Fort Kent Memorial.

The Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (copy enclosed) require the Federal agency to consult with the State Historic Preservation Officer to determine what properties included in the National Register or eligible for inclusion will be affected by the project and whether or not any of those effects will be adverse. If together you make a finding of "no adverse effect," you should forward documentation of that finding to the Advisory Council for review. That documentation should include a description of the Federal project and why it has no adverse effect, a statement of the views of the State Historic Preservation Officer, and supporting graphic materials.

Therefore, the next step is for you to be in contact with the Maine Historic Preservation Officer. He is Mr. James Mundy, and can be reached at Maine Historic Preservation Commission, 31 Western Avenue, Augusta, Maine 04330, 207-289-2133.

Thank you for your cooperation in this matter. If we may be of any additional assistance, please contact Myra Harrison of the Advisory Council staff at 202-254-3974.

Sincerely yours,

Ann Webster Smith

Ann Webster Smith
Director, Office of Compliance

Exhibit No. 4

Maine Department of Agriculture

Maynard C. Dolloff, Commissioner

REPLY TO:
MAINE SOIL AND WATER CONSERVATION COMMISSION
Charles L. Boothby, Executive Director
State Office Building, Augusta, Maine 04330
Telephone 207/289-2666

August 15, 1974

Joseph L. Ignazio, Chief
Planning Division
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Ignazio:

I have reviewed the design drawings for the Fort Kent Local Protection Project and have asked several other agencies for their comments as well. Copies of their response are attached.

It is our understanding that two additions are to be made to the plans, namely: 1. The concrete wall and slide gate are being deleted with an extension of the dike westerly to compensate; and 2. a sewer outfall near the blockhouse will require some type of flood gate.

Has the project been evaluated relative to the effects of loss of flood storage on increased damages upstream, downstream, and across the river?

Sincerely,

Charlie Boothby

Charles L. Boothby
Executive Director

CLB/ba
Enclosure

Exhibit No. 5

STATE OF MAINE

JUN 26 1974

Inter-Departmental Memorandum

Date June 21, 1974

To Charles Boothby, Executive Director — Dept. Soil & Water Conservation Commission

From Daniel Webster, Jr. — Dept. Transportation - Bureau of Planning

Subject Proposed Local Protection Project, Fort Kent

This office has reviewed the drawings prepared by the Corps of Engineers for the subject project in your office and offer the following comments.

It appears that the proposed work would have an impact on Main Street in Fort Kent and since this is a Federal Aid State Highway, it will be necessary to have the proposal reviewed by our division office in Presque Isle at the appropriate time for the purpose of obtaining street opening permits.

As final plans are developed for this project, it would be desirable to communicate also with our division engineer regarding existing utilities, drainage problems, safety considerations (an effort should be made to insure that roadside obstructions are not built into the project), traffic control and maintenance problems.

We appreciate the opportunity to review these plans, and look forward to continued communication regarding this project.

Daniel Webster, Jr.
Director

DW/el
cc: Raymond S. Wile, Ass't. Div. Engr., Presque Isle

Exhibit No. 6

State of Maine
Executive Department
State Planning Office
189 State Street, Augusta, Maine 04330

KENNETH M. CURTIS
GOVERNOR

PHILIP M. SAVAGE
STATE PLANNING DIRECTOR

TEL. (207) 289-326

JUL 2 1974.

July 1, 1974

Charles L. Boothby, Executive Director
Maine Soil & Water Conservation Commission
Augusta, Maine 04330

Dear Mr. Boothby:

I took the opportunity of examining the drawings prepared by the U.S. Army, Corps of Engineers, on the proposed flood protection project at Fort Kent, Maine. From my brief study of these drawings, a number of questions and suggestions arise.

The proposed concrete wall, which a note attached to the maps indicated would not be constructed, had a top elevation of 521.0 feet above M.S.L. The proposed dikes had elevations between 518.0 feet near the Fort Kent blockhouse and 520.0 feet in other locations. Therefore, the water level which these proposed works would protect against is not entirely clear. For discussion purposes, it can be assumed to be about 520.0 feet.

Measuring very roughly on the Project Plan, an area of about 37 acres was to be protected to an elevation of 520 feet by about 500 feet of concrete wall and about 3,250 linear feet of dikes. Both the length of the dikes and the area enclosed would be extended if the concrete wall is eliminated and the dike extended westward to enclose all area below 520 foot elevation. About 4 to 5 additional acres would be protected by such an extension. Given the existing land uses within this 37 acre area, what is the assessed valuation of these residential, commercial and public/semi-public land uses and structures? What is the projected cost of the proposed dikes and associated drains and other works? What is the cost of raising and otherwise flood proofing to 520.0 elevation of buildings within the area to be protected? What is the cost of physically relocating the homes and businesses below the 520.0 foot elevation which, for one reason or another, are uneconomical to flood-proof? Without much of the above information, a definitive evaluation of the project is not possible.

Obtaining these costs is vital to evaluate other options which do not require construction of dikes. Examination of the Corps of Engineers maps and old U.S.G.S. Quad sheets indicates that the 520 foot contour is approximately on the line of Main

Exhibit No. 7

and Elm Streets from the Main Street bridge extending westerly to about where the Bangor & Aroostook Railroad swings southerly diverging from Main Street west of the International Bridge. Realignment of Main Street along the 520 contour and removal of most buildings northerly of this line would permit construction of an entirely new commercial downtown, perhaps even a covered mall and multi-unit housing south of Main Street. The area north of relocated Main Street would contain parking, with most of the land remaining open as a landscaped riverfront park with the Fort Kent blockhouse as a focal point. The entire town would then be safe from flood waters without a dike which would probably raise the flood level somewhat since it would effectively "fill" the river's flood plain.

If the Federal Government is willing to spend a sum of money to construct dikes to avoid flood damage, a similar sum should be available to achieve the same result with greater benefits in terms of Fort Kent's economy and urban design. The opportunity to create a townsite overlooking a landscaped riverfront park instead of a townsite cut off from its river by dikes should not be lost.

It is clear that Fort Kent's recurring problem with ice jams and floods on the Saint John River must be solved if the townspeople and businesses are not to suffer further hazards and expense, the latter being shared by all taxpayers. However, the solution should reflect some creative urban design and not merely add dikes which would detract from the existing urban situation.

I'm sure the Northern Maine Regional Planning Commission would be happy to assist Fort Kent in getting the maximum possible benefits from the opportunity presented to them by the Federal funds available to relieve the flooding problem.

A tracing of the Project Plan and a possible alternative design are enclosed to supplement the text.

Respectfully,

Fourtin Powell

Fourtin Powell
Regional Planner

FP:emh
Enc.
c: James Barresi, Executive Director
Northern Maine Regional Planning Commission

Exhibit No. 7

DEPARTMENT OF

Inland Fisheries and Game

MAYNARD F. MARSH, COMMISSIONER

J. WILLIAM PEPPARD, DEPUTY COMMISSIONER

AUGUSTA, MAINE 04330

May 29, 1973

Col. John H. Mason, C.E.
Division Engineer
Department of the Army, New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Col. Mason:

This Department visualizes no long term problems due to the proposed dike in Fort Kent, Maine as presented at the May 14, 1973 meeting.

We are concerned, however, with siltation problems during construction and ask that the final plans and specifications be submitted to this office for approval prior to the bidding phase of the project.

Very truly yours,

Maynard F. Marsh

Maynard F. Marsh
Commissioner

MFM/bb

Exhibit No. 8

ST. JOHN RIVER LOCAL PROTECTION
FORT KENT, MAINE

DETAILED PROJECT REPORT
FOR WATER RESOURCES DEVELOPMENT

DIGEST OF PUBLIC MEETING

14 MAY 1973

APPENDIX 3

PREPARED BY THE
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

APPENDIX 3

DIGEST OF PUBLIC MEETING

APPENDIX 3

DIGEST OF PUBLIC MEETING

Name	Interest Represented & Remarks
John L. Martin	Maine State Senator Requests all efforts be made by the Corps of Engineers to help stop the flooding. The Governor, he informs, is behind a project that will protect Fort Kent, the more protection the better. Recommends a monitoring system to forecast flood warning downstream. Against removal of island proposed by Mr. Lambert.
Emilien Levesque	State Bureau of Civil Defense (Under Military and Veteran Services) Representing Governor of Maine as well. Concerned that dike of 517' m. s. l. will not be sufficient, and wants protection from Fish River flooding. Wants complete protection. Concerned over loss of disaster assistance. Wants to know if further protection will be provided in a project to follow this one. Confident that benefit-cost ratio will be favorable.
Elmer Jalbert	Resident Wants to know how much the dike would raise the water level of the Saint John River. Would it bottleneck the river? How high should he build?

Keith Lambert	Property owner Suggests moving island and using soil from the island as fill as well as deepening the channel.
Bernard Nadeau	Merchant whose store was flooded Wants to know whether Mactaquac Dam contributes to Fort Kent's flood problem. Does it raise the water level? Is the Corps of Engineers in touch with its Canadian counterpart?
Robert Soucey	Fort Kent Planning Board What are the costs of maintaining the pumping station on a yearly basis? Can the Maine Power Authority undertake a dam project at Dickey-Lincoln?
Don Michaud	Resident Why not dike from the Fish River to the Blockhouse?
Maurice Albert	Resident Does the ledge in the area of the church function as a bottleneck, restraining the waters?
Claude Dumond	Town Manager of Fort Kent Concerned about the details of the operation of the pumping station. Where will the lines go? Will surface drainage all go through?

Charles Boothby	Executive Director, State Soil and Water Conservation Commission At the 517' m. s. l. can water still enter Main Street at the upper end of the dike?
Peter Bourque	Maine Department of Inland Fisheries and Game. How far into the Saint John River will the dike extend? How long will it take to construct? Intends to submit an impact statement.

ST. JOHN RIVER LOCAL PROTECTION
FORT KENT, MAINE

DETAILED PROJECT REPORT
FOR WATER RESOURCES DEVELOPMENT

OTHER REPORTS

SECTION - A

ADDENDUM

APPENDIX 4

PREPARED BY THE
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

APPENDIX 4

ADDENDUM

ADDENDUM

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ST. JOHN RIVER

LOCAL FLOOD PROTECTION

FORT KENT, MAINE

APPENDIX 4

(Addenda Required by Water Resources Council Procedure #1)

Principles and Standards for Planning Water and Related Land Resources

1. Introduction. Studies of alternative plans for local flood protection along the St. John River at Fort Kent, Maine, have been completed and are described in the Detailed Project Report. The purpose and role of this addendum is to implement objectives of the Principles and Standards and provide supplemental information on Environmental Quality (EQ) as a basis for plan selection and recommendation.

2. Planning Objectives. The singular objective of the study is to provide a viable, economically justified plan of local flood protection for the commercial center of Fort Kent.

3. Summary of Study Area Concerns. The principle concern of the citizens and officials of Fort Kent is the elimination of flooding, which on a short-term basis causes social and economic disruption of the community, and in the long-term reduces the opportunity for sustained economic growth. Continued cutting of timber in the upper watershed above Fort Kent has resulted in an increased frequency of flooding which provided record flood levels in April 1973, and again in May 1974. Social anxiety associated with the threat of future flooding is an extreme concern to the townspeople. The Governor of Maine and the Fort Kent Town Council have expressed concern over this worsening flood situation.

4. Description of the Recommended Plan. The proposed plan of improvements provides for the construction of 3,250 linear feet of earth dike, a pumping station and appurtenances, a pressure conduit and a raised roadway at Blockhouse Road. The earth dike would extend from high ground about 950 feet upstream of the International Bridge to an existing embankment near the Fort Kent Blockhouse. The dike would consist principally of compacted and random earth fills with an 18 inch

layer of stone protection on 12 inches of gravel bedding on the river-side slope. The landside slope would be topsoiled and seeded.

A draft EIS has been coordinated with necessary Federal and State agencies as well as Fort Kent officials, and their comments have been included in the submission to OCE and CEQ.

5. Description of the EQ Plan. The selected environmetal quality (EQ) plan, which is considered to be the least damaging to the natural regimen of the river and flood plain, is physical evacuation of the commercial center of Fort Kent to higher ground away from the river. Because most of the wood frame buildings have been damaged by past floods and are relatively old they could not be moved and would be demolished and reconstructed at the alternate site. Some 64 commercial and public use buildings and 37 private homes would be removed from 40 acres of flood plain lands. Because of the need for expanding the economic base of the community and the congested nature of the existing commercial center it would be necessary to provide 100 acres for the new town center. Because most of the land surrounding the flood plain is either developed or on hilly terrain the relocated area would most likely involve land taking of productive potato fields located over five miles from the existing town center. Resources necessary to implement this plan include heavy construction equipment for building, street construction and utility placement, construction materials and manpower for labor.

Procedures involved with developing the EQ plan included:

(a) Determination of availability of undeveloped land.

(b) Cost of required lands.

(c) Amount and types of utilities to be relocated or rebuilt.

(d) Cost of new roadway construction.

(e) Amount of social disruption to the community.

(f) Acceptability of the plan to the community.

(g) Environmental impact of the relocation.

(h) Determination of space requirements and costs for building construction.

6. Impact Assessment. Table 1 presents data on significant economic, social and environmental impacts that would result from both the EQ and recommended plan. The assessment was conducted by NED personnel utilizing information obtained at the Public Meeting of 14 May 1973 and property value data provided by the Northern Maine Regional Planning Commission. Local officials were instrumental in determining the recommended plan of improvements for local flood protection at Fort Kent.

7. Evaluation. Of all the structural and non-structural alternative plans investigated it was determined by more thorough study that the plan of flood control improvements which maximized project benefits and was desirable to the local community should be the recommended plan. The plan of flood plain evacuation provided the least impact on the environment but was six times more expensive than the recommended plan and was not acceptable to town officials. The attached news clip taken from the Boston Herald of 29 September 1974 emphasizes this fact. Table 2 presents the results of the evaluation in terms of the system of accounts required by the Principles and Standards.

8. Summary of Unresolved Problems. The draft Environmental Impact Statement was coordinated with Federal, State and local agencies during September and October 1974. All comments were favorable toward the recommended plan of structural improvements except for the State Planning Office which stated that Federal funding should be put toward the EQ plan instead of the recommended improvement. Because evacuation of the flood plain is not acceptable to community officials the State Planning Office recommendation is not considered to be an unresolved problem. No court actions are contemplated for the proposed project.

9. Mitigation Measures. Because there is considerable support for construction of the local flood protection project and no unresolved problems exist, no mitigation measures for the recommended plan or alternative are anticipated.

10. Determination of Need for Reformulation. Information contained in this addendum indicates that reformulation is not necessary. Because of the hardship that has occurred at Fort Kent during the record floods of 1973 and 1974, time is a primary factor in the project analysis. In addition, because of the extremely short construction season in northern Maine (mid-June to early October) it is imperative that if 1976 flooding is to be prevented, a contract must be awarded by 1 June 1975.

TABLE 1

SUMMARY COMPARISON OF ALTERNATIVE PLANS
FORT KENT LOCAL FLOOD PROTECTION

	RECOMMENDED PLAN	EQ PLAN
A. Significant Impacts	(1) Allows for expansion of economic base and labor market. (2) Relieves anxiety associated with fear of future flooding. (3) Restricts view of river. (4) Prevents easy access to river. (5) Removal of diseased elm trees.	(1) Allows for expansion of economic base and labor market. (2) Relieves anxiety associated with fear of future flooding. (3) Causes temporary social disruption of the community. (4) Allows for "green-belt" planning for flood plain.
B. Plan Evaluation	(1) Prevents inundation of flood plain. (2) Prevents future property damage. (3) Plan does not have impact or National significance on NED, EQ, SWB or RD. (4) The social well being of local residents would be greatly improved. (5) Plan is acceptable to the community. (6) B/C ratio is 2.3 to 1.0	(1) Restricts use of flood plain. (2) Prevents future property damage. (3) EQ plan is favored by N.M.R.P.C. (4) Economic development would not be substantially different from that affected by the recommended plan. (5) Plan is not acceptable to the community. (6) B/C ratio is 0.65 to 1.0
C. Implementation Responsiblity	(1) Corps of Engrs will fund design and construction costs. (2) State/local will provide lands, easements, utility relocations and maintain and operate.	(1) No present requirement for Corps participation. (2) State/local would be responsible for plan implementation.

TABLE 2

UPDATED BENEFIT / COST COMPARISON
FORT KENT LOCAL FLOOD PROTECTION

	RECOMMENDED PLAN		EQ PLAN
	Orig. Formulation	Current Val.	Current Value
Interest Rate	5-3/8	5-7/8	5-7/8
Period of Analysis	50 yrs.	50 yrs.	50 yrs.
Annual Benefits			
Flood Control	$40,000	$208,630	$261,290
Redevelopment	4,100	16,411	77,925
Recreation	0	0	0
TOTAL	$44,100	$225,041	$339,215
First Costs			
Federal	$526,000	$1,310,000	$ 0
Non-Federal	46,000	200,000	6,529,000
TOTAL	$572,000	$1,510,000	$6,529,000
Annual Costs			
Federal	$30,500	$81,665	$ 0
Non-Federal	3,700	15,468	521,000
TOTAL	$34,200	$97,133	$ 521,000
B/C Ratio	1.3 to 1.0	2.3 to 1.0	0.65 to 1.0

SEP 29 1974

New England Newsclip

Plan to Move Businesses Is Opposed

FORT KENT, Maine (AP) — Officials of this Canadian border town are drafting a letter to the U.S. Army Corp of Engineers to counter a state planner's recommendation that the town's business district be relocated on higher ground.

Fort Kent has been plagued by heavy flooding the last two springs.

Planner Fourtin Powell wrote to the Army corp recommending that the low-lying areas along the St. John River be cleared.

Powell said the downtown should be moved to higher ground instead of building a dike to protect the existing business district. He suggested using federal funds for relocation rather than for a dike.

But town manager Claude Dumond is opposed to the plan.

"Where do they want us to move the town to? We are bordered by the St. John River on one side and mountains on the other," he said.

Dumond said the state planner is jeopardizing the town's chances of getting the dike approved in Washington.